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Construction Begins to Zoom!

◆

"THE construction industry has begun to zoom" is the highly optimistic and soul-satisfying declaration at the beginning of the F. W. Dodge construction report dated November 12.

◖ A staid and conservative organization such as the Dodge Corporation does not make assertions of this kind without good cause.

◖ Support for the cheerful declaration is found in the report itself.

◖ In October, as a glowing example, the volume of construction undertaken in the 37 states east of the Rocky Mountains totaled $200,863,700. This contrasts very favorably with the totals of $167,376,200 for the previous month, and it is 50 per cent greater than the total of $135,224,800 reported in October of last year.

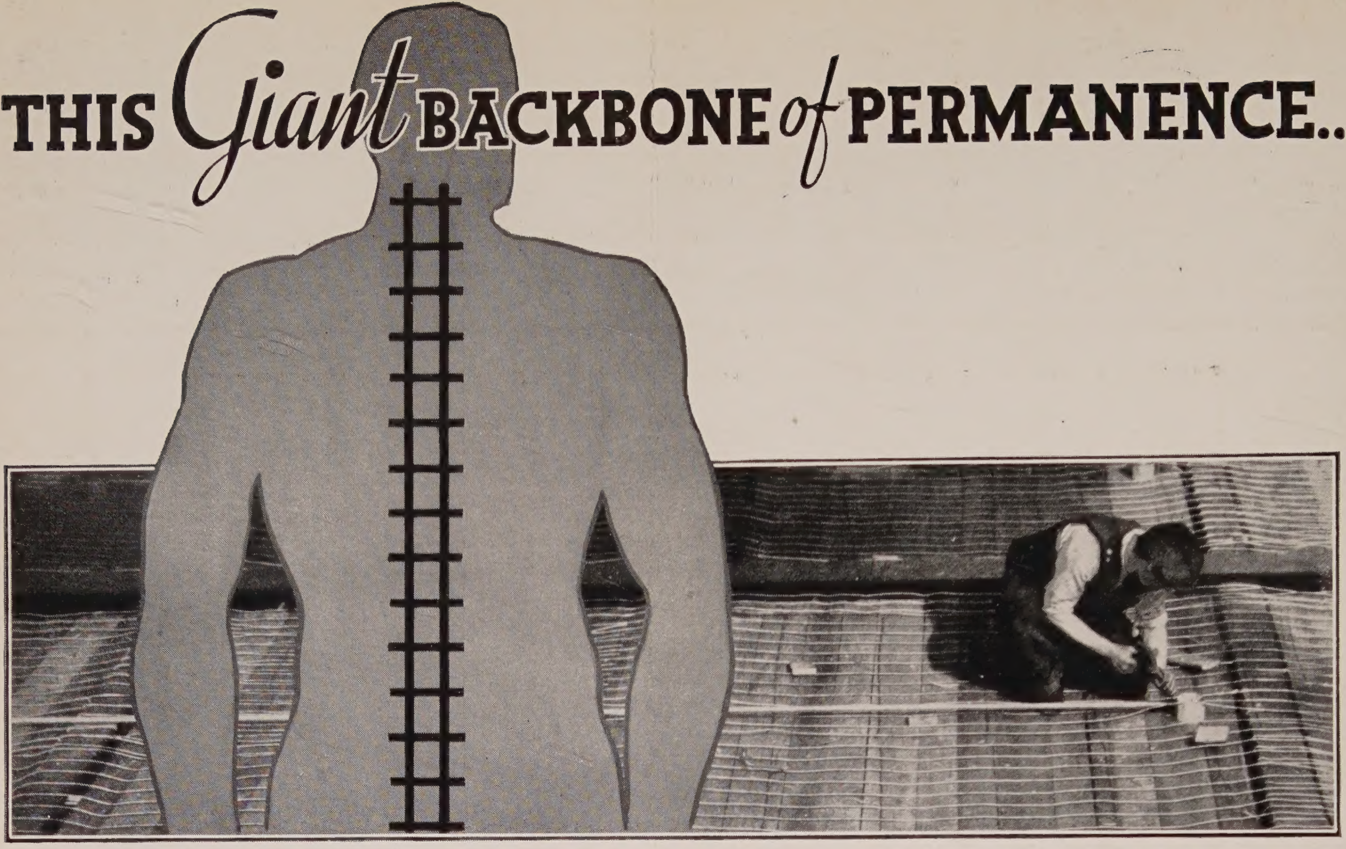
◖ Aside from December, 1933, the peak of PWA activity, one must go back to the autumn months of 1931 to find construction volume equal to that of October, 1935.

◖ While residential construction continues as the brightest of the bright spots in the picture, other branches of the construction industry are not lagging.

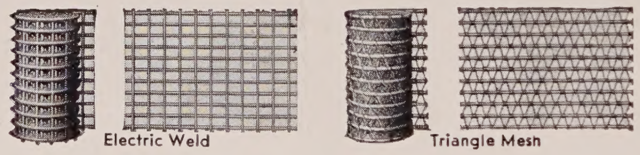
◖ Heavy engineering contracts, for instance, amounted to $86,315,000 in October, compared with $65,239,400 in the same month of 1934.

◖ The most encouraging feature of this rising construction volume is the fact that it is coming from increased private building activity.

THIS *Giant* BACKBONE *of* PERMANENCE..



.. IS EASY TO HANDLE



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Concrete
Vol. XLIII, No. 12
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RESTORE OLD MISSIONS
with Reinforced Concrete

Set New Concrete Columns Within Ancient Pilasters—Reinforced Concrete Beams and Shell Support Roof and Dome

FIVE old Franciscan missions in the vicinity of San Antonio, Texas, are being reconstructed and restored to a condition far more substantial than their original condition, through the application of modern reinforced concrete design and construction methods. The restoration is being accomplished as a Federal work relief project.

The missions were built by the Franciscan fathers more than two hundred years ago. Time, weather and vandalism have wrecked parts of these historic buildings. Now modern methods and materials are not only completely restoring them to their original beauty, but structural engineering skill is strengthening them to stand for centuries to come.

Old Masonry Walls Dangerous

Actual reconstruction work was commenced first on the San Jose Mission, the building of which was started in 1720. The great stone-vaulted dome and roof of this mission collapsed during a storm in December, 1868. Later the vaulted stone roof and east wall of the granary fell. Finally, in 1928, the beautiful stone tower crashed down.

When the work of reconstructing the dome and the vaulted roof over the church, as well as the roof over the granary, was started, a very careful examination was made of the remaining walls. They were found to be in such a precarious condition, structurally, that it was decided that the load of the new concrete roof and dome would have to be carried down separately through the walls to individual footings, so that no additional load would be placed on the ancient walls. Even though the walls were 4 ft. thick, with added 3-ft. pilasters and buttresses inside and out, this was not sufficient to overcome the handicap of poor mortar and stone used in the original construction.

Reinforced Concrete Frame and Dome

It was determined this time to use a permanent construction; and reinforced concrete was chosen for the structural work of the roof and dome.

When the work is completed, the church will have the identical lines and design of the original, both inside and out, and the reinforced concrete frame will make the church last many times longer than it would with the original structural elements. To do this it was necessary to chisel down through the pilasters of the ancient walls, forming slots in which the concrete columns with their reinforcement were placed. They, in turn, rest on concrete footings well below the old walls, on a good bearing soil.

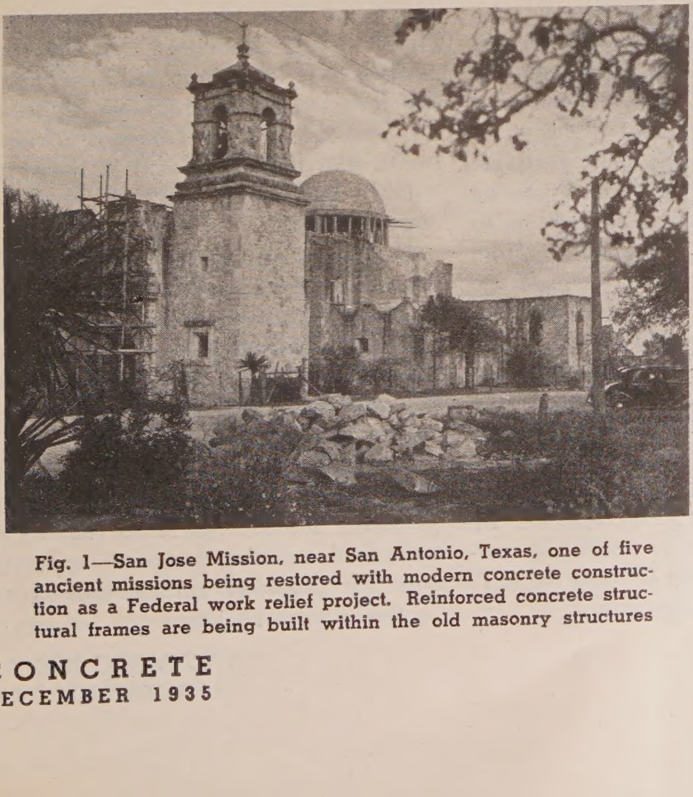


Fig. 1—San Jose Mission, near San Antonio, Texas, one of five ancient missions being restored with modern concrete construction as a Federal work relief project. Reinforced concrete structural frames are being built within the old masonry structures

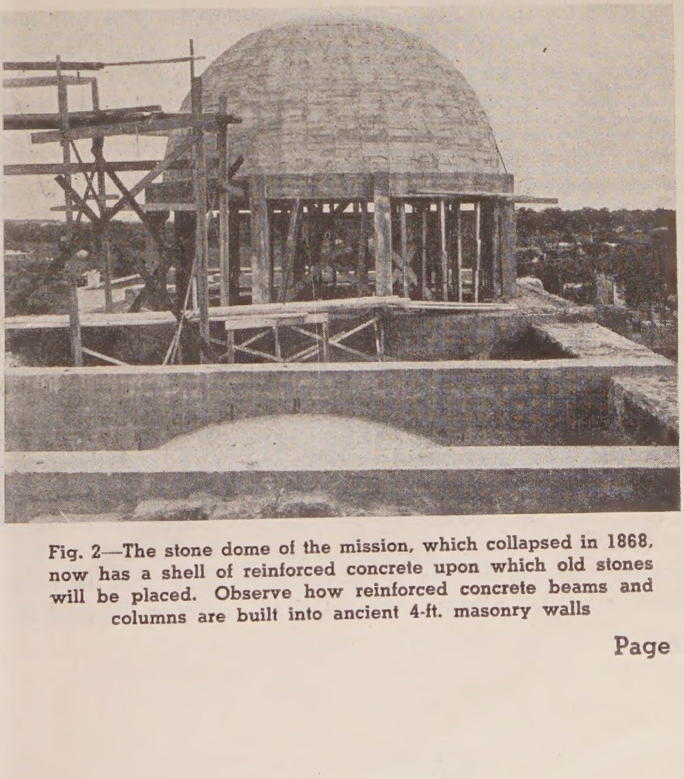


Fig. 2—The stone dome of the mission, which collapsed in 1868, now has a shell of reinforced concrete upon which old stones will be placed. Observe how reinforced concrete beams and columns are built into ancient 4-ft. masonry walls

At the roof line, great curved beams now carry the roof load in the same shape as the original stone-vaulted roof; and then, at the crossing of the nave, the dome rises to a height of some 60 ft. above the floor of the nave. This same general method was used in rebuilding the roof of the old granary.

Great semi-circular ribs of reinforced concrete now carry the roof load and the thrust down to the footings below the pilasters. The original roof had cracked open right down through the center of the nave. Even with the tremendous thickness of the side walls, and with flying buttresses out beyond these on either side, they could not withstand the thrust.

The restored dome, as shown in one of the illustrations, now has a shell of heavily reinforced concrete. Upon this shell the original stones of the dome, lying on the ground in a heap of ruins since 1868, will be placed.

How Old Missions Were Built

In connection with plans for the restoration work, Harvey P. Smith, the architect in charge of the work, put in months in a study of the construction of the missions; and incidentally, he delved into the historical background.

"I was particularly interested in learning how these great vaulted stone roofs were constructed in those early days by the padres, with only Indian labor and without modern machinery or knowledge of engineering," Mr. Smith said.

"First, the outer walls were begun all around. When the masons had built as high as they could lift the stone, earth was brought in by Indian laborers to raise the level of the workmen. Then they built the wall higher, and repeated the process of carrying in more earth. Finally, when they had reached the spring line of the arched roof, more dirt was hauled in and rounded out in a great hemi-spherical mound, on which the stones of the roof were placed, and locked with key stones. When the mortar had thoroughly set, all of the earth was dug out from underneath, and the structure stood completed.

"This was all very simple when the cost of labor was very low and time was no object; but with our modern methods of form work and reinforced concrete, a tremendous saving in time, labor, and money is brought about, together with the everlasting quality of reinforced concrete to carry the beauty of these old missions on down through the ages for the pleasure of posterity."

Practical Skill Displayed

Mr. Smith paid high tribute to the practical skill displayed by these early Franciscans. "Though these padres came with the devout intention of christianizing the Indian tribes in this territory," he said, "their first thought had to be for the practical construction of the buildings in which they were going to live, work and worship. Furthermore, they had to surround these buildings with a high fortress-like wall to protect them from attacks by unfriendly tribes.

There are four present owners of the San Jose Mission, called "Queen of all the Missions in New Spain." The Roman Catholic Church diocese of San Antonio owns the church and the convent buildings and the ground immediately surrounding them; the Conservation Society owns the old granary, prefecture, and a part of the soldiers' quarters; the Franciscan Order owns the northeast corner of the mission wall, while Bexar county owns the great plaza surrounded on three sides by the outer walls of the fortress in which the peaceful mission Indians were housed.

Acknowledgments

As previously stated, Harvey P. Smith, A.I.A., was the architect in charge of this restoration and reconstruction project. Structural engineers for the work were George Moore, and J. W. Beretta Engineers, Inc.

County Judge Frost Woodhill, County Commissioner Mullinax and Congressman Maury Maverick are credited with obtaining official approval of the restoration plan as a work relief project.

The work on the church has had the personal attention of Monsigneur M. S. Garriga, with the sanction of Archbishop A. J. Drossaerts of the Diocese of San Antonio.

Members and officers of the Conservation Society co-operating on the work were Mrs. Lane Taylor and Mrs. Rena Maverick Green, past presidents, Mrs. Elizabeth Graham, president, and Miss Anna Ellis, historian.

The others missions included in the restoration program are La Purisima de Concepcion, San Juan de Capistrano, and San Francisco de Espada, all three commenced in 1731, and the famous Alamo, also known as San Antonio de Valero Mission, commenced in 1744.

The old Spanish Governors' Palace, built in 1749, was restored with reinforced concrete in 1929, under the supervision of Architect Smith.

Space for A. R. B. A. Road Show Is Over-Subscribed

Exhibitors Take Average of 590 Sq. Ft.—Highway Construction Programs Developing

THE final day of the period during which applications could be filed for space at the A. R. B. A. Road Show to be held in Cleveland's New Exhibition Hall from January 20 to 24 brought applications for more than 25,000 sq. ft. of space, bringing the total up to within 5 per cent of the capacity of the building. Since then, available space has been over-subscribed and an additional wing of the building had to be acquired. Space taken ranges from 100 to 4,000 sq. ft., and the average space reserved by exhibitors is 590 sq. ft., an all-time high record.

The Road Show is accepted by the highway industry and profession as the barometer of highway-street construction, and the fact that the 1936 show was a "sell out" three months in advance of its opening is regarded by A. R. B. A. officials as conclusive evidence that the industry is "over the top" and on the road to prosperity.

At the same time announcement was made of these latest developments preliminary to the A. R. B. A. convention and Road Show, the U. S. Bureau of Public Roads announced that highway projects have been approved in 43 states that have submitted programs for regular Federal-aid and emergency relief funds, and that additional projects involving millions of dollars are being approved daily.

Following closely upon these disclosures was the announcement by the Works Progress Administration that approval has been given to farm-to-market road projects for a total of $164,000,000 and municipal street projects for approximately $184,000,000.

Grade-crossing projects are moving more slowly than highway and street projects, but several states have had their grade-crossing programs approved and this phase of construction is expected to move rapidly.

CEMENT-WATER RATIO
a Simpler Method

● Urges Simplification of Concrete Design on Job Through More General Application of Newer Method

By GEORGE ROBERT WERNISCH
Concrete Reinforcing Steel Institute Research Fellow
Lehigh University, Bethlehem, Pennsylvania

ANYONE familiar with the water-cement ratio method of designing concrete mixes to obtain any desired consistency will realize the great amount of trouble involved. The usual procedure is to make a paste of the water-cement ratio which would insure a concrete of the desired strength, and add fine and coarse aggregate until the desired slump is obtained. From the amounts of fine and coarse aggregate added, the proportions can be calculated. Whenever a different strength is desired, another paste must be made and aggregate added until the desired consistency is obtained. If a water-cement curve is necessary, we must make up five or six different paste concentrations in order to plot Abrams' strength curve.

Adopt Cement-Water Ratio Method

In research work undertaken at Lehigh University, the water-cement ratio method of designing concrete mixes has long been discarded as inefficient and unsatisfactory, and the cement-water ratio method of proportioning has been adopted. At the present time this method of designing concrete mixes, although simple and easy to understand and adopt, is not being used as extensively as its advantages warrant. Its simplicity and relative accuracy for field design justify further investigation and use.

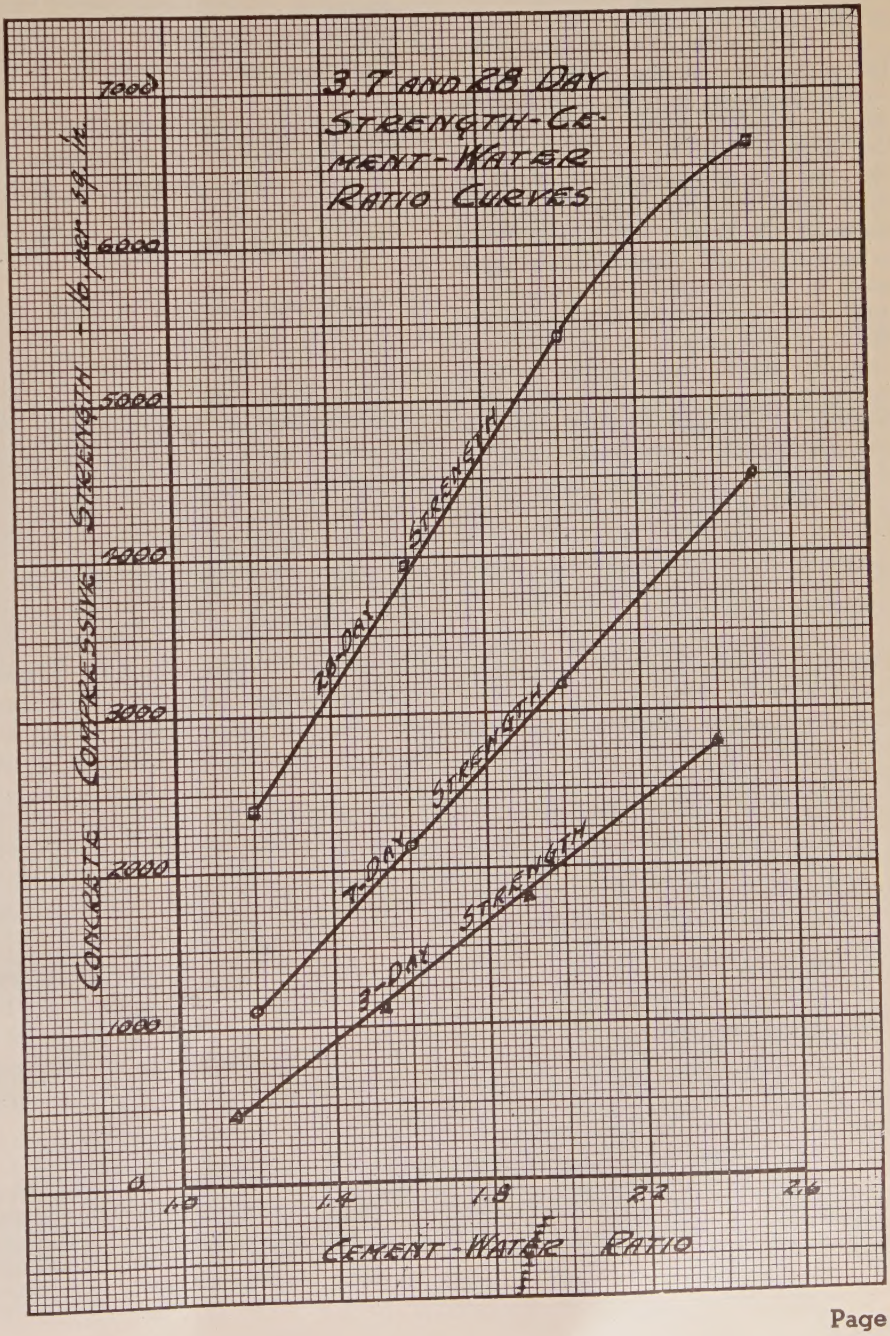
Heretofore it has been believed that the water was the determining strength factor in concrete. Abrams deduced this theory when he obtained a definite relationship of strength to water-cement ratio by using different amounts of water, the cement content remaining constant. However, if the water content had been kept constant and various amounts of cement added, undoubtedly it would have appeared that the cement was the governing strength factor.

The Lyse Theory

Professor Inge Lyse contends that the cement, and not the water, is the governing factor, for if we use a constant water content (in order to keep the consistency the same), the strength will vary as the ratio of the cement to water nearly in lineal proportions. It is important to note that the water content for any desired slump remains constant no matter what strength is required. This method of design is much more logical and simple in application, and is reasonably accurate. Its greatest advantages are that the strength-cement-water curve is very nearly a straight line (thus requiring only two points to plot) and that we can change from one strength to another by a very simple mathematical operation which does not require any further laboratory work.

Professor Lyse states his theory as follows:

"The net water content per unit of



concrete was kept constant for all the mixes which had the same aggregate as that used in the trial batch. The cement content was determined by multiplying the net water content by the given cement-water ratio, and the change in richness of the mixes was accomplished by substituting 0.85 lb. of aggregate of the type and gradation used, for each pound decrease in cement content, or vice versa."

The Method Stated

The cement-water ratio method of design is given herewith:

(1) Find the ratio of fine to coarse aggregate which will give the greatest weight per unit volume. In this manner we obtain a weight proportion in which we have the least amount of voids; obviously, the less voids, the less paste required to fill said voids.

(2) Choose the desired consistency. Let us assume that the ratio of fine to coarse aggregate, in order to obtain the most economical design, is 2:3. Mix a dry batch of 1:2:3 by weight of cement, fine and coarse aggregate, respectively. Add water until the desired slump is obtained. If the mix obtained is found to be too wet, add coarse and fine aggregates in the predetermined proportions until the proper consistentcy is obtained. With a bit of care it is not difficult to approach the desired consistency without adding too much water. Make the necessary correction for absorption, determine the net cement-water ratio, the net amount of water in the mix, and the proportions of the mix. The mix thus obtained is called the BASIC MIX.

(3) Inasmuch as the water content of the mix remains constant for any determined slump, type and gradation of aggregates, the amount of solid material must also remain constant. If, in order to increase the cement-water ratio, a greater amount of cement must be present than in the BASIC MIX (say X pounds more) then 0.85 X pounds of aggregate must be subtracted from the aggregate found in the BASIC MIX. Similarly, if cement must be subtracted from the BASIC MIX, 0.85 pounds of the subtracted cement, in aggregate, must be added to the mix.

The ratio of 0.85 is obtained as follows:

Sp. Gr. of aggregate = 2.65
Sp. Gr. of cement = 3.10
$2.65/3.10 = 0.85$

EXAMPLE

Weight in Grams

The following mix gave a 6-in. slump (desired consistency):

2,270:4,540:6,810 — 1,424 gr. water = BASIC MIX
Assume 1 per cent absorption
Water = 1,424 — (4,540 + 6,810) 0.01 = 1,310 grams NET

Sample Computation:

1. $c/w = 1.2$; $c = 1.2 \times 1{,}310 = 1{,}572$
2. $2{,}270 - 1{,}572 = +698$
   (Therefore, inasmuch as 698 grams of cement have been subtracted from our basic mix, $698 \times 0.85 = 592$ grams of aggregate must be added in the ratio of 2:3 in order to keep the amount of solid per unit volume constant)
3. $592 \times 0.40 = +237$
   (fine aggregate to be added)
   $592 \times 0.60 = +355$
   (coarse aggregate to be added)
4. New Mix: Cement = 1,572 grams
   Fine Aggregate = 4,540 + 237 = 4,777
   Coarse Aggregate = 6,810 + 355 = 7,165
   Proportions: 1,572:4,777:7,165 = 1:3.04:4.56
   $c/w = 1.2$ Water $= c/1.2 + 1$ per cent absorption.
   Or instead of steps 3 and 4:
   $4{,}540 + 6{,}810 + 592 = 11{,}942$
   $0.4 \times 11{,}942 = 4{,}777$
   (sand in New Mix)
   $0.6 \times 11{,}942 = 7{,}165$
   (coarse aggregate in New Mix)

Establishing the Curve

Once the proportions of the various mixes have been determined, the mixes are made up, specimens made and cured, compressive strengths determined, and the results plotted, strength as ordinate and cement-water ratio as abscissa. The results will very nearly plot as a straight line. The aforesaid mixes plotted as shown in the diagram.

Once the cement-water curve has been established, it is an easy matter to obtain mixes for other slumps. If a 4-in. slump is desired, water is added to a 1:2:3 (2,270:4,540:6,810) mixture of cement, fine and coarse aggregate until the slump is obtained. The net water is calculated. After some experience in designing, one can guess the water content which will give the approximate slump within reasonable limits, and make the necessary correction after the first batch has been mixed, without any trial runs. Assume net water as 1,200 grams. Sample calculation:

Desired strength: 3,500 lb., 7 days;
$c/w = 2.12$ (from curve, Fig. 1)
Cement $= 2.12 \times 1{,}200 = 2{,}545$ gr.
$2{,}545 - 2{,}270 = +275$ grams cement which must be added to above mix
$275 \times 0.85 = 234$ grams aggregate to be subtracted from above mix
$234 \times 0.4 = 94$ grams fine aggregate to be subtracted
$234 \times 0.6 = 140$ grams coarse aggregate to be subtracted
New Mix
Cement:
2,545 gr.
Fine Aggregate:
$4{,}540 - 94 = 4{,}446$ gr.
Coarse Aggregate:
$6{,}810 - 140 = 6{,}670$ gr.
2.545:4,446:6,670 = 1:1.75:2.62
Water $= 1/2.12 + 1$ per cent absorption.

Simplifies Design of Mix

The cement-water ratio method is a simplification of procedure in designing concrete mixes. The consistency of the concrete remains nearly constant, regardless of the richness of the mix, providing the type and gradation of the aggregates and the weight of water per unit volume remains constant. For all practical purposes the range of c/w would not be much greater than 1.25 to 2.25, within which range the aforesaid statement holds. For every pound of cement added (in excess of the original amount present in the BASIC MIX), 0.85 pound of aggregate is subtracted from the mix; for every pound of cement subtracted from the basic mix, 0.85 pound of aggregate is added. The strength-cement-water curve is very nearly a straight line and is believed to show the strength and water quantity relation in a much simpler and more satisfactory manner than the water-cement curve. The form and equation of the curve are more easily handled. As the richness of the mix increases, it may be necessary to increase the water content per unit volume, but this is very easily done without destroying the advantages of the method.

c/w	Water, grams	Cement, c, gr.	2,270 minus c	Subtract or add Sand 40%	Subtract or add Agg. 60%	New Mix	Proportions
1.2	1,310	1,572	+ 698	+237	+355	1,572:4,777:7,165	1:3.04:4.56
1.6	1,310	2,096	+ 174	+ 59	+ 89	2,096:4,599:6,899	1:2.19:3.29
2.0	1,310	2,620	— 350	—119	—178	2,620:4,421:6,632	1:1.69:2.53
2.5	1,310	3,275	—1,005	—342	—513	3,275:4,198:6,397	1:1.28:1.92

SEWAGE DISPOSAL PLANTS to Stop Stream Pollution

- Amazing Conditions Disclosed by State Planning Boards — National Resources Committee Offers Program

THE menace of stream pollution has long been recognized by sanitary engineers and officials. Effective means for its elimination have been sought, but the problem is still a matter of serious concern, partly because of the lack of legal authority and partly because of lack of public interest. Construction of sewage treatment works is being undertaken by progressive communities, but in numerous other instances orders to clean up unsanitary conditions along water courses go unheeded because of inadequate legislation to enforce the orders.

Lack of Public Interest

The amazing lack of public interest in the face of increasing contamination of our lakes and streams was emphasized in an editorial on page 22 of the July (1934) issue of CONCRETE, printed under the heading *Sewage Disposal Needed to Protect Nation's Water Supply*.

Very properly, that editorial urged the construction of sewage disposal plants for all communities, large or small, as the one practicable method of putting a stop to this deadly contamination. But the extent to which American cities and towns are failing to meet this threatening situation is shown in a report recently issued by the National Resources Committee.

Conditions Are Inexcusable

Pointing out that practically every state planning board has studied sewerage and sewage disposal systems, the report just mentioned discloses some of the inexcusable conditions existing.

The Kansas State Planning Board discovered that the sewage of 46 per cent of the urban population is returned to the surface water supply either inadequately treated or not treated at all. In Minnesota, only 121 of the 256 municipal and 24 large institutional sewerage systems have sewage treatment plants. Sewage handling and treatment for the State of New Jersey as a whole is said to be clearly inadequate. The sewage from population centers having 8,393,000 people is discharged untreated into the waters of New York State. The worst pollution naturally occurs in populous areas where recreational facilities are most needed.

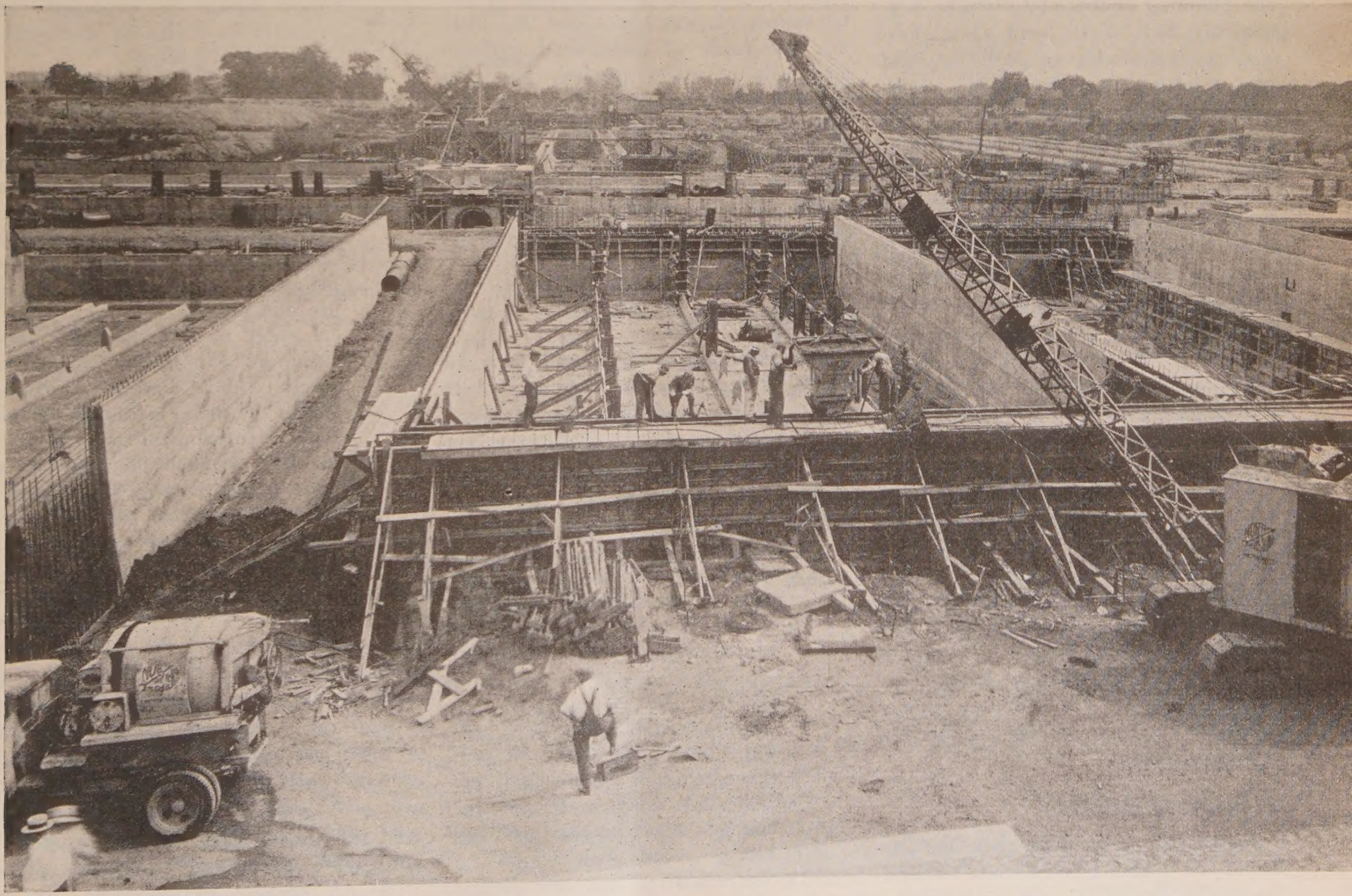


Fig. 1—PWA loan made possible this extension to the Columbus (Ohio) sewage treatment plant, which will stop pollution of Scioto River

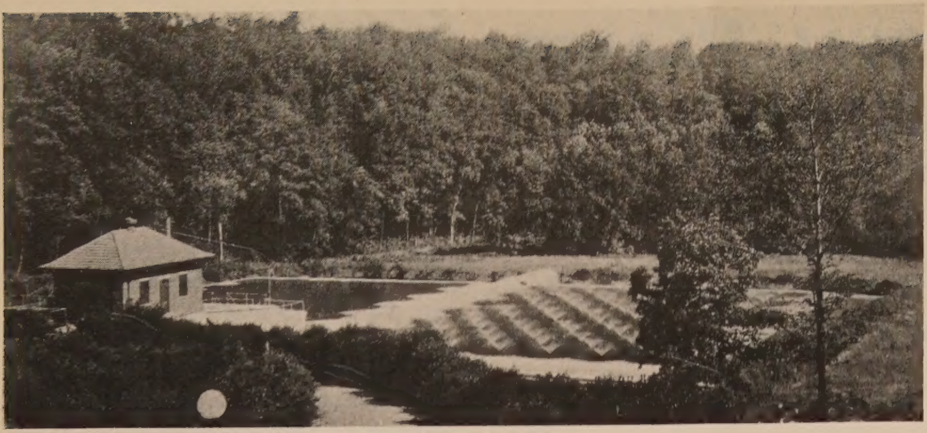


Fig. 2—Completed sewage disposal plant at Rochester, N. Y.

Economic Losses

An example of the economic loss suffered by damage to state recreational facilities is seen in New Jersey, where the state planning board reports that for many miles the streams of the state are so badly polluted that all thought of their recreational use has long since been abandoned.

In other states where the serious effects of pollution are understood, the difficulties in the way of immediate remedial steps are quickly recognized. The planning boards of Colorado, Connecticut, New York, and Ohio have made special studies of pollution damages resulting from industrial wastes, and New York reports that "to stop industrial pollution without serious injury to the industries causing it, and therefore without detriment to the local people employed by them, requires close co-operation with the industries in studying their problem and assisting them to develop adequate treatment processes."

Other states, such as Indiana, Iowa, and Virginia, have made efforts to evaluate similar economic losses which they believe aggregate millions of dollars annually.

The Connecticut State Water Commission made a systematic examination of the watersheds of all principal streams, and estimates of the volume of sewage, both raw and treated, discharged into each. The Iowa State Planning Board undertook a survey project to determine the adequacy of existing sewage disposal plants, the need for new plants, their size and type, and the adequacy of sewerage systems.

A Proposed Program

Something can be done about the situation, the National Resources Committee thinks, through co-operation between state and Federal governments. The committee proposes a well-considered program, aimed at interstate control on the basis of drainage areas where possible, and a co-operative program of investigation to be carried out by legally constituted state and federal agencies.

The need for action on a definite program is strikingly brought out by the findings of a factual survey of pollution reported by the advisory committee. The report indicates that many states are faced with serious pollution problems affecting important sources of water supply. It was also found that little use was made of established uniform standards of water quality, and that many states do not have satisfactory legislation to cope with existing conditions. The indictment is made that insufficient effort is being made to protect public health and water fowl and fish life from the effects of domestic and industrial waste.

A Six-Point Plan

The special advisory committee of the National Resources Committee, which prepared the report here under discussion, recommends the following six-point program for control of water pollution.

(1) Where drainage area authorities exist for the comprehensive development and control of water, their scope should be made sufficiently broad to include control of pollution.

(2) No basic changes in existing federal law with reference to water pollution control should be made until the experimental program presented later herein shall have indicated whether or not such changes are desirable and feasible.

(3) Simplification and co-ordination of state laws should be effected to provide for the following minimum requirements:
  (a) Adequate administration control.
  (b) Delegation to the administration agency of power to determine the nature and extent of pollution prohibited by the statutes, and to establish limitations of pollution.
  (c) Appropriate mandatory powers, particularly the power to compel the installation of essential remedial works and force other necessary action.
  (d) No limitation on the taxing or bonding power of municipalities, when applied to remedial works ordered by the administrative agency.
  (e) Power to require facilities, through sewerage districts or otherwise, that will enable municipalities and industries to comply with the law.

(4) Broader authorization for research should be granted to those agencies of the federal government which are already concerned with the various phases of the problem, and adequate funds should be provided for properly co-ordinated water-pollution investigations.

(5) Powers and funds should be granted to an appropriate federal agency to initiate a co-operative program of investigation with legally constituted state agencies for such special studies as appear desirable, and particularly for the development of appropriate standards for water use and control.

(6) In order to stimulate the construction of pollution abatement works, funds for the purpose should be made available by the federal government to local public and private agencies on a grant-in-aid or loan basis. Lacking any precedent for the designation of an appropriate basis for such allocation, the committee recommends the creation of a demonstration unit on a river system selected for that purpose.

It is imperative that intelligent action be taken to safeguard our water resources, as engineers have repeatedly pointed to the significant fact that ground-water levels have been receding for some years. It is difficult to arouse the general public to the seriousness of impaired water supply, but it is the duty of officials to recognize this in planning future improvements.

Flexural Strength Predetermined

Methods Employed in Arriving at Required Proportions to Produce Specified Modulus of Rupture

By E. W. BAUMAN
Engineer of Materials and Tests, Tennessee Department of Highways, Nashville, Tenn.

THE first installment of this article, printed in the November issue, discussed the various factors that control the flexural strength of concrete and brought out the important point that there is no direct relation between flexural strength and compressive strength. The present installment describes methods employed in determining the proportions necessary to meet a specified requirement for flexural strength.

Arriving at the Proportions

The Tennessee Highway Department specifications pertaining to concrete for slab construction call for a modulus of rupture of 750 lb. per sq. in. at 28 days, but in no case less than a theoretical cement factor of 1.40 bbl. of cement per cu. yd. of concrete; also, a slump of approximately 1½ in. to provide workability; and the aggregates are to be proportioned by weight.

Since there is a more direct relation between the weight of aggregates and their solid volume than between weight per cubic foot and loose or dry-rodded condition, it was decided to abandon the use of dry-rodded volumes and adopt the solid volume basis for expressing proportions and computing concrete yield.

With this basis of proportioning, it is necessary that accurate determinations for specific gravity of aggregates be made. It was found that the present A.S.T.M. method for determining specific gravity of coarse aggregate called for entirely too small a sample and especially so when the coarse aggregate was obtained from a river deposit of varying mineralogical compositions. Tests made in our laboratory indicated that the larger the sample used in specific gravity determinations, the more accurate would be results obtained as representative of the deposit for use in converting solid volume to weight. Accordingly, all specific gravity determinations on coarse aggregate were made by one operator on samples of at least 10,000 grams, in a saturated but surface-dry condition. Surface-drying of these large samples was accomplished by placing a sample on a wire mesh and passing an artificial draft of warm air over and through it by means of electric fans. The specific gravity determinations on sand were made by the usual laboratory procedure, and results obtained were found to be satisfactory as indicating the average value for a given deposit.

Cement

The amount of cement to be used with a given combination of aggregates was set according to characteristics of the coarse aggregate to be tested. Since the specifications did not permit a cement factor lower than 1.40 bbl. per cu. yd. of concrete, and previous concrete tests performed by the department indicated that the sharp, angular coarse aggregates yield as much as 750 lb. per sq. in. modulus of rupture with this amount of cement, those combinations with coarse aggregate possessing this characteristic were set at 1.40. Coarse aggregates being structurally sound, but rounded and having smooth surfaces, were set with a cement factor of 1.45, while coarse aggregates of questionable quality were set for a cement factor of 1.50 to 1.70.

Water

Here we called on experience from the field to arrive at a probable water-cement ratio required to produce the necessary plasticity and workability. The mixtures using angular coarse aggregate required more water for a given condition than those using rounded coarse aggregate. Other things being equal, the amount required to produce 1½-in. slump concrete was approximately 5.6 gallons per bag of cement, or a water-cement ratio of 0.75 loose (water-cement ratio of 1.57, solid volume basis)[7] for the rounded aggregate, and around 6½ gallons, or 0.87 water-cement ratio loose (1.82 water-cement ratio, solid volume basis) for the angular. Accordingly, those water-cement ratios were set up for use in calculating the preliminary laboratory proportions.

Fine and Coarse Aggregate

While there are several methods recommended for determining the ratio of fine to coarse aggregate in a concrete mixture, they all involve the determination of fineness modulus, weight per cubic foot, or some other variable characteristics of the aggregates; and any factor derived from laboratory tests would have to be checked continually in the field and adjustments made to the results obtained. A few preliminary trial mixes showed that regardless of the method employed in calculation, it was not likely that less than 34 per cent of the combined volume (solids of fine plus coarse aggregate) in any mixture could be given to sand and yet obtain a workable concrete.

Here again the characteristics of the coarse aggregate with regard to angularity seemed to set up a logical differential, for while a minimum of 34 per cent of combined fine and coarse aggregate solids could be used with rounded coarse aggregate, it required a minimum of 37 per cent sand for workability with angular aggregate. Two series of preliminary tests furnished results which indicated that this percentage could be increased as much as 5 per cent without materially affecting the strength. So for the first series of trial tests a factor of 37 per cent for sand was set up to be used in mixtures of rounded aggregate and 40 per cent ($V_f + V_c$) for angular aggregate.

Concrete technicians generally recognize the importance of using the minimum amount of sand in a mixture necessary to obtain workability, in order to offset the possibility of creating a condition which would produce high volume change. Uniformity of the fine aggregate for any one job was provided by imposing a limit in permissible variation of 0.5 in fineness modulus from the results obtained from the sample submitted as being representative of the job conditions, and of coarse aggregate by prescribing certain limits to be retained on various screens.

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[7] See Table II. Tables and Curves for Use in Designing and Establishing Concrete Mixtures, by Herbert O. Gelkey. **Proceedings** ACI, Vol. 25, 1927.

Computing Weights for Trial Batches

The mixer used in the laboratory is a Blystone, 3 cu. ft. capacity, motor-driven unit. One batch made enough concrete to fill two beam molds, 6 by 6 by 34 in., and one 6 by 12-in. cylinder form. So a half-bag batch was used because it came near the necessary yield, and at the same time provided convenience in calculations.

The two following examples will illustrate the procedure followed:

Case I. Preparation of materials for combination of coarse aggregate which is a crushed limestone, maximum size, 2 in.; specific gravity, 2.72; fine aggregate, well graded sand; fineness modulus, 2.60; specific gravity, 2.56; water tentatively set at 0.87 water-cement ratio (loose); and cement at 1.40 cement factor; sand ratio is 40 per cent.

$V_1 + V_2 + V_3 + V_4 =$ Yield of concrete,

Where V = Solid volume
V_1 = Cement
V_2 = Water
V_3 = Fine aggregate
V_4 = Coarse aggregate

For a 1-bag batch,
$V_1 = 0.48$ cu. ft.
$V_2 = 0.87$ cu. ft.

Yield of 1-bag batch on basis of 1.40 cement factor $= \frac{6.75}{1.40} = 4.82$ cu. ft.

$V_3 + V_4 = \text{Yield} - (V_1 + V_2)$,

or

$V_3 + V_4 = 4.82 - (0.48 + 0.87) = 3.47$ cu. ft.

$V_3 = 40$ per cent of $3.47 = 1.49$ cu. ft.

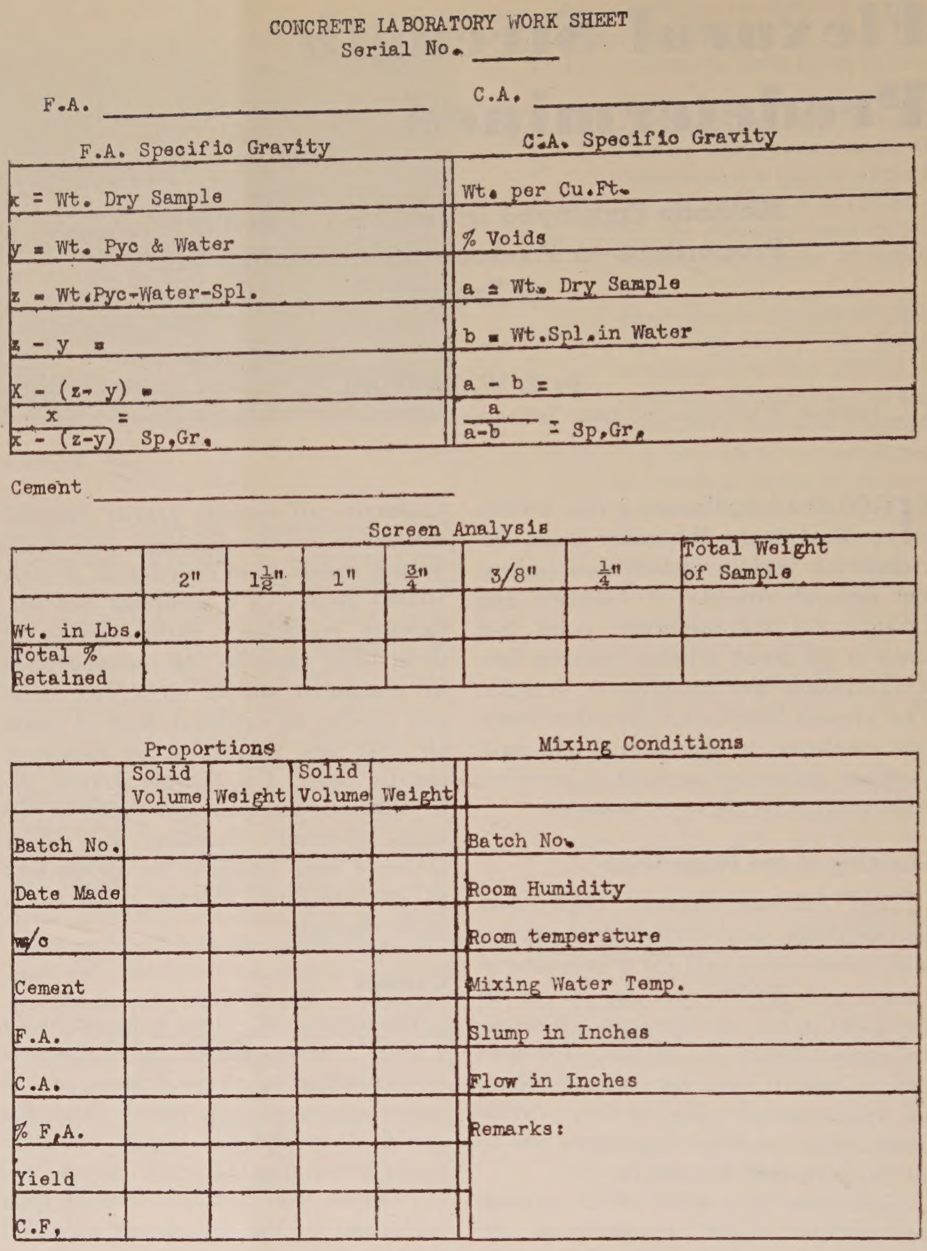
$V_4 = 3.47 - 1.39 = 2.08$ cu. ft.

Hence, *Solid Volume* proportions are 0.48:0.87:1.39:2.08.

Converted to weight, these proportions equal:

94	lb. of cement
54.25	lb. of water
233	lb. of sand ($V_3 \times$ sp. gr. $\times 62.4$)
354	lb. of stone ($V_4 \times$ sp. gr. $\times 62.4$)

Since a batch in the laboratory was to be on the basis of ½ bag, the weights per laboratory batch for the above conditions are: 47 lb. of cement, 27.22 lb. of water, 116½ lb. of sand, 177 lb. of stone.



CONCRETE LABORATORY WORK SHEET
Serial No. ______

F.A. ______________________ C.A. ______________________

F.A. Specific Gravity	C.A. Specific Gravity
x = Wt. Dry Sample	Wt. per Cu.Ft.
y = Wt. Pyc & Water	% Voids
z = Wt.Pyc-Water-Spl.	a = Wt. Dry Sample
z - y =	b = Wt.Spl.in Water
x - (z- y) =	a - b =
$\frac{x}{x - (z-y)}$ = Sp.Gr.	$\frac{a}{a-b}$ = Sp.Gr.

Cement ______________________

Screen Analysis

	2"	1½"	1"	¾"	3/8"	¼"	Total Weight of Sample
Wt. in Lbs.							
Total % Retained							

Proportions

	Solid Volume	Weight	Solid Volume	Weight
Batch No.				
Date Made				
w/c				
Cement				
F.A.				
C.A.				
% F.A.				
Yield				
C.F.				

Mixing Conditions
Batch No.
Room Humidity
Room temperature
Mixing Water Temp.
Slump in Inches
Flow in Inches
Remarks:

Case II. Assume aggregate combinations to be tested as follows: Rounded coarse aggregate, high per cent loss by abrasion, specific gravity, 2.40; fine aggregate same as *Case I;* cement factor tentatively set at 1.55; water set tentatively at 0.75 water-cement ratio (loose); fine aggregate = 37 per cent of total aggregates. Yield with 1.55 cement factor = 4.35 cu. ft.

$V_1 + V_2 = 1.23$
$V_3 + V_4 = 4.35 - 1.23 = 3.12$ cu. ft.
$V_3 = 0.37 \times 3.12 = 1.15$ cu. ft.
$V_4 = 3.12 - 1.15 = 1.97$ cu. ft.

Converted to weight, as in *Case I:*

94	lb. of cement
46.7	lb. of water
184	lb. of fine aggregate
296	lb. of coarse aggregate

Above weights of aggregates are based on saturated but surface-dry condition.

Mixing

The cement and aggregates properly weighed out were placed in a skip and mixer-charged by raising the skip. The dry ingredients were allowed to mix for several revolutions of the mixer blades, and then water from a container was drained through a short section of hose with a cut-off valve until the proper consistency was obtained. There was always a little more water in the container than necessary for any one batch, so the amount retained was weighed back and the net water added to the mixture was recorded. The same operator added water for all tests and was able to tell by appearance of the concrete in the mixer when the proper workability was obtained. Mixing for each batch was permitted for 1½ minutes, insuring thorough mixture after addition of the last increment of water. The concrete was discharged into a wheelbarrow, and samples were taken for determination of slump and flow and then wheeled to the forms and molded. Curing and testing were followed as required by A.S.T.M. D78-30T. The accompanying form headed *Concrete Laboratory Work Sheet* illustrates the manner in which design data were recorded, during the time the mixture was in progress in the concrete laboratory. At the age of 28 days the beams were tested in accordance with A.S.T.M. C78-30T on a span length of 18 in.

Long Beam Providing Two Breaks Desirable Over Smaller Ones on Single Break

Since the beams were 34 in. long as molded in the laboratory, each beam provided two breaks. Obviously, the more results available for any test project, the closer would be the average to the true value (Reference: "Number of Specimens on Test of Concrete and Concrete Aggregates Required for Reasonable Accuracy of Average," contributed by Roy W. Crum to Symposium of Significance of Tests of Concrete and Concrete Aggregates, Committee C-9, A.S.T.M.). If only the minimum number of three specimens made on different days required by A.S.T.M. were tested, only three test factors would be available to be used as information in setting up concrete proportions for projects involving considerable yardage, which, of course, is not sufficient. By increasing the length of the beam 60 per cent over that required for span length, two breaks are available on one beam, thereby doubling the amount of data obtainable from any test series. The advantages of two breaks from one beam over single breaks from two beams are a saving on the amount of concrete, fewer forms are necessary, and less space is taken up in the moist-room. These advantages will be found to be quite valuable in undertaking a test program of any magnitude. There is an overhang for the first break on these long beams which theoretically should be noted in computing the stress, but for all practical purposes can be ignored because this is small in comparison with inaccuracies apparent in the beam tests.

Table 1 shows the results of beam breaks for various conditions from two individual beams as against two breaks from a long beam of the same batch; and as shown by comparing the averages of the two conditions, very little difference exists.

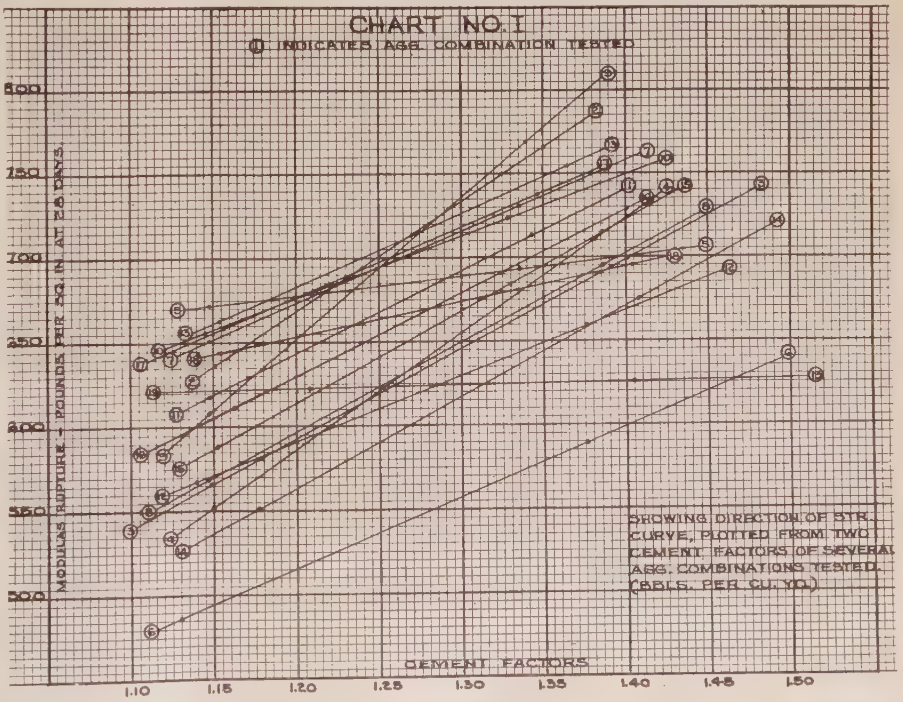
TABLE 1—COMPARING RESULTS, IN LB. PER SQ. IN., OF SINGLE TESTS ON TWO BEAMS WITH TWO TESTS ON SINGLE LONG BEAMS FOR VARIOUS PROPORTIONS

Group Number	Type C.A.	Cement Factor	Short Beam, Single Break Beam 1	Beam 2	Average	Long Beam, Two Breaks Break 1	Break 2	Average
1	Gravel 1½ in.	1.15	584	478	581	576	578	577
2	Gravel 2 in.	1.15	567	565	566	571	565	568
3	Cr. stone 2 in.	1.15	644	653	649	649	653	652
4	Gravel 2 in.	1.20	581	578	579	584	578	581
5	Gravel 1½ in.	1.20	700	681	690	652	681	677
6	Cr. stone 2 in.	1.20	689	707	699	737	707	722
7	Gravel 1 in.	1.25	650	673	662	672	673	675
8	Gravel 1½ in.	1.25	673	656	665	650	656	653
9	Cr. stone 2 in.	1.35	743	747	746	740	747	744
10	Cr. stone 2 in.	1.35	764	742	754	746	742	745
11	Gravel 1½ in.	1.40	703	710	707	728	710	719
12	Gravel 2 in.	1.40	685	688	687	684	688	686
13	Gravel 1½ in.	1.45	722	733	728	722	733	728
14	Gravel 1 in.	1.45	724	744	734	744	744	744
15	Gravel 2 in.	1.45	742	735	739	690	735	713

Interpolation Between Two Strength Results on Curve Provides Fairly Accurate Means for Arriving at a Cement Factor Required to Produce Predetermined Strength

In testing an aggregate combination on which little information is available as to the probable modulus of rupture to be expected with a certain cement factor, it is possible to develop a curve from the results of two trial batches of high and low cement factors from which one can predict with reasonable accuracy the cement factor required with that combination for any other strength wanted. On *Chart I* are plotted strengths (modulus of rupture) obtained from two trial batches each, of several combinations of aggregates tested in the Tennessee Highway Laboratory. The few trial attempts carried out by laboratory tests to check predicted strengths against cement factors shown on the curve produced results surprisingly close. Consider, for instance, strength results from Series 3 as plotted on Chart I. By prolonging the line plotted between the strengths obtained from a cement factor of 1.40 and one of 1.15, it intersects the 750-lb. strength line at the point of 1.50 cement factor. Check tests made on this combination with this factor produced beam strengths of 755 lb. per sq. in. Other combinations tested also produced equally close results to those on the curve. The curves plotted are shown as straight lines on the chart because only two points were obtained. It is probable that with more points some other directions of the curve would develop.

It is interesting to note that with the exception of curves for Series 19, 18, 5,



2, and 9, the slope of all curves is practically identical. This suggests the possibility of predicting transverse strengths of concrete with varying cement factors, after one result has been obtained by some equation such as:

$$Y = aX(\text{slope of curve}) \pm C$$

Where Y = Modulus of rupture, in lb. per sq. in.

X = Cement factor

a = Function expressing scale range

C = A factor which is the function of results, being negative if a rather low result is obtained from the single test series and positive if above the average from the single test series.

Standard Set of Beams Made with Every New Combination to Correct Irregularities of Testing Technique

At the outset of our program it was thought advisable to run a standard set of beams each day a new material combination was to be tested. The standard set was to be made up of the same materials and under closely identical conditions of proportions, water-cement ratio, et cetera, each time it was run; and a factor was to be evolved by averaging results over a period of time which was to be used in correcting results of test series run on that same day. This is in line with procedure for testing cement by using a 1:3 standard Ottawa sand mortar and computing a ratio of strength with other sets tested at the same time. It is recognized that conditions of the concrete laboratory affected by humidity and temperature as well as the personal element of the operators making the tests, might affect the results of any one day's concreting. This was recognized by the A.S.T.M., and to offset the possibility of throwing all the error in one set of beams it provided that any one series is to be tested on three different days, intending that out of the three cycles not more than one might be seriously out of line. By carefully observing certain test conditions such as controlling temperature of mixing water, somewhere around 70 deg., providing for complete saturation of the aggregates prior to surface-drying, which should always just precede the mixing, and by having the same crew do all the concrete manipulation, it was found that transverse strength results from the standard sets were so uniform over a period of time of one year as to make any adjustment on the other series of minor consequence.

As shown by Datagraph No. 1, in tabular and chart form, results obtained from the standard sets in January differ from those obtained in July or December by much less than 5 per cent. Perhaps the value of running a standard set would be worth while when it becomes necessary to make check tests on an aggregate combination which is producing freak strength results in the field, or in testing a new series at a time when the laboratory personnel are somewhat out of practice in making up concrete mixtures after a prolonged cessation of operations.

Results obtained from the set of cylinders taken from each standard batch indicate that variations existing from time to time in results of these specimens were much more pronounced, as is shown in Datagraph No. 2.

Developing Field Proportions from Laboratory Data

After all specimens were tested, results of the twelve individual breaks for any one combination were averaged and those varying more than 5 per cent from the mean were thrown out. This is a much closer margin of irregularity allowed in test results than is the case with cylinders used for compression in any investigation of concrete. If the strength factor obtained was 750 lb. modulus of rupture, which was the required strength, and data carried on the laboratory work sheet indicated that the desired workability was obtained by the use of a reasonable water-cement ratio, the same proportions as those carried in the laboratory, converted to weight, would be recommended for field use. Any results lying within 25 lb. (plus or minus) of 750 lb. per sq. in. were regarded as meeting the strength requirements. If strength results were decidedly off the desired factor, a new trial batch was made up, with a cement factor determined from the curve for that combination as previously explained. In the event that the strength was obtained, but the laboratory data showed that the resultant mixture was rather harsh in workability, or was slightly undersanded, adjustments would be made in the calculated mix and a trial batch run through the laboratory to ascertain

(*Continued on page* 20)

Table 2—Copy of Information Furnished Paving Contractors Relating to Concrete Proportions for Tennessee Highway Construction

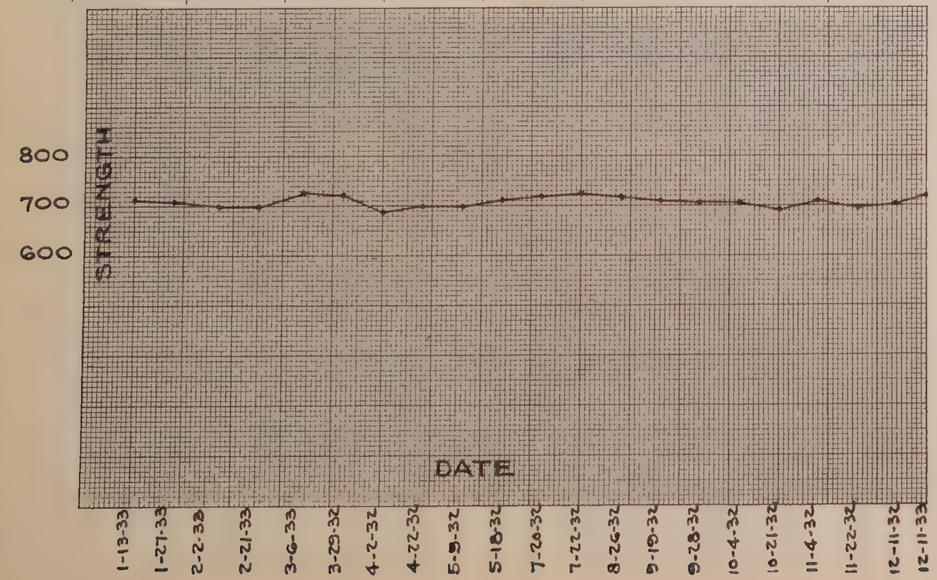
Material Combinations	C.A. Size	Water Gals.	Dry Wts. F.A.	Dry Wts. C.A.	Yield	C.F.	Sp. Gr. F.A.	Sp. Gr. C.A.
A	1	6.6	230	359	4.82	1.40	2.72	2.72
B	2	6.7	235	350	4.82	1.40	2.72	2.72
C	2	6.7	235	354	4.82	1.40	2.72	2.75
D	1	6.0	227	366	4.82	1.40	2.63	2.71
E	1	5.6	183	306	4.22	1.60	2.64	2.60
F	3	5.8	217	331	4.65	1.45	2.63	2.56
G	1	5.1	212	352	4.65	1.45	2.63	2.56
H	2	5.2	217	344	4.65	1.45	2.63	2.56
I	3	5.4	231	354	4.82	1.40	2.63	2.56
J	2	5.4	238	366	4.82	1.40	2.63	2.70
K	1	6.0	207	346	4.65	1.45	2.65	2.61
L	2	6.1	210	339	4.65	1.45	2.65	2.61
M	2	5.6	208	321	4.65	1.45	2.56	2.42
N	3	5.8	213	313	4.65	1.45	2.56	2.42
O	1	6.4	218	359	4.82	1.40	2.56	2.71
P	1	6.2	219	362	4.82	1.40	2.56	2.71
Q	1	5.5	210	353	4.65	1.45	2.65	2.60
R	2	5.6	215	345	4.65	1.45	2.65	2.60
S	3	6.0	195	284	4.50	1.50	2.56	2.27
T	1	6.6	216	357	4.82	1.40	2.56	2.71
U	1	6.7	214	356	4.82	1.40	2.56	2.71
V	3	5.6	220	310	4.65	1.45	2.63	2.37
W	3	5.8	213	313	4.65	1.45	2.56	2.42
X	2	5.8	208	318	4.65	1.45	2.58	2.42
Y	3	6.2	221	323	4.82	1.40	2.58	2.40
Z	1	5.8	209	349	4.65	1.45	2.65	2.61
AA	2	5.9	212	343	4.65	1.45	2.65	2.61
BB	3	5.9	228	347	4.82	1.40	2.63	2.56
CC	2	6.0	220	352	4.82	1.40	2.63	2.56
DD	3	6.1	225	344	4.82	1.40	2.63	2.56
EE	2	5.5	214	320	4.65	1.45	2.63	2.40
FF	3	5.7	219	312	4.65	1.45	2.63	2.40
GG	1	6.1	227	364	4.82	1.40	2.65	2.71
HH	2	6.7	226	354	4.82	1.40	2.62	2.75
II	1	5.8	205	349	4.65	1.45	2.62	2.61
JJ	2	6.0	210	341	4.65	1.45	2.62	2.61
KK	2	5.6	210	318	4.65	1.45	2.58	2.40
LL	2	5.6	210	318	4.65	1.45	2.58	2.40
MM	3	5.8	214	311	4.65	1.45	2.58	2.40
NN	2	5.8	235	361	4.82	1.40	2.63	2.70
OO	3	5.7	219	312	4.65	1.45	2.63	2.40
PP	3	5.8	214	311	4.65	1.45	2.58	2.40

DATAGRAPH
TRADE MARK
TEST SHEET. FORM 301

NO. I
DATAGRAPH SHOWING

TEST NO.
NATURE OF TEST Transverse Tests of
SHEET NO.
APPARATUS Standard Beams over
DATE
MATERIAL
DETAILS period of one year
OBS'R

DATE MADE	BATCH AVG.	% VAR. from mean	DATE MADE	BATCH AVG.	% VAR. from mean
1-13-33	709	+0.7	7-22-32	722	+2.6
1-27-33	701	+0.4	8-26-32	718	+2.0
2-2-33	698	-0.9	9-19-32	708	+0.6
2-4-33	697	-1.0	9-28-32	701	+0.4
3-6-33	726	+3.1	10-4-32	702	-0.3
3-29-32	719	+2.1	10-21-32	690	-2.0
4-2-32	681	-3.3	11-4-32	706	+0.3
4-22-32	698	-0.9	11-22-32	693	-1.6
5-5-32	694	-1.4	12-11-32	700	-0.6
5-18-32	710	+0.9	12-11-33	719	+2.1
7-20-32	712	+1.1			

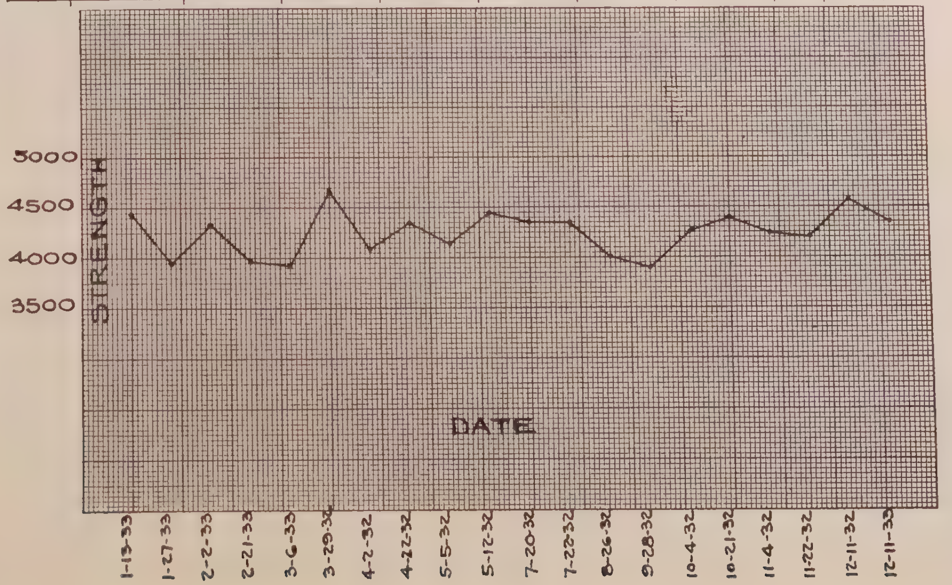


DATAGRAPH
TRADE MARK
TEST SHEET. FORM 301

NO. II
DATAGRAPH SHOWING

TEST NO.
NATURE OF TEST Compressive Tests of
SHEET NO.
APPARATUS Standard Cylinders over
DATE
MATERIAL
DETAILS period of one year.
OBS'R

DATE MADE	AVG. Strength	% VAR. from mean	DATE MADE	AVG. Strength	% VAR. from mean
1-13-33	4484	+5.2	7-20-32	4365	+2.4
1-27-33	3957	-7.2	7-22-32	4365	+2.4
2-2-33	4333	+1.7	8-26-32	4013	-5.8
2-21-33	3976	-6.7	9-28-32	3905	-8.4
3-6-33	3921	-8.0	10-4-32	4258	-0.1
3-29-32	4650	+9.1	10-21-32	4394	+3.1
4-2-32	4092	-2.0	11-4-32	4240	-0.5
4-22-32	4346	+2.0	11-22-32	4214	-1.1
5-5-32	4155	-2.5	12-11-32	4571	+7.3
5-18-32	4486	+5.3	12-11-33	4348	+2.0



EDITORIAL

Out of Sight, Out of Mind

The amazing situation that is threatening the purity of our water supply, and therefore the health and vitality of the American people, is dragged out into the open in a report on *Water Resources Problems*, published recently by the National Resources Committee, Washington, D. C.

More than a year ago, in an editorial on page 22 of the July (1934) issue, CONCRETE emphasized the need for sewage disposal plants in all communities, large or small, if the nation's water supply is to be protected from serious contamination. Other editorials on this all-important subject, on page 11 of the June (1934) issue of CONCRETE, and on page 11 of the August number, pointed out the devastating effect of dumping sewage into streams, and reference was made to one method through which disposal plants may be financed.

Engineers and public health officials are fully awake to the dangers of water contamination; but everywhere they are handicapped because of the inadequacy of existing legislation and the lack of public support and co-operation. This lack of public support is, in fact, the underlying cause of the lack of effective legislation.

As a consequence of this apathetic attitude of the public, one of the first necessities confronting the movement toward sanitation is that of creating popular sentiment in its favor. That is a difficult problem, for the practice long prevailing in our cities and towns that have sewerage systems is to run the sewers into the river and let the communities further down stream worry about it.

The old adage, "out of sight, out of mind," still lives in the public mind. The rising younger generation and some among those of the older generations can be converted to a different frame of mind; but only through sustained and well-directed effort can this be accomplished.

Fireproof Homes at Home Shows

The first of a nation-wide series of *National Home Shows* will open in Baltimore on January 4; the second is scheduled to open at San Diego on January 15, coinciding with the reopening of the San Diego Exposition. Other home shows are being planned for Boston, Buffalo, Philadelphia, Miami, Louisville, Indianapolis, Milwaukee, Minneapolis, Kansas City, Houston, and Oakland.

These *National Home Shows* are promoted, managed and financed by local organizations, with the cooperation of the Federal Housing Administration and the Manufacturers' Housing Display Council. Specially designed educational housing exhibits are provided by the Federal Housing Administration. Local real estate boards, better-housing committees, and local civic groups are also participating.

A special feature of the Baltimore Home Show will be a completely furnished 5-room cottage, and it is probable that model homes of various types will be major attractions in some of the other cities.

Here is an opportunity for local concrete construction groups to give prospective home owners a practical example of what constitutes a *fireproof concrete* home. Let them build a complete home, completely furnished; but in some unobtrusive location in the rear part of the house, let a construction-minded home owner see the actual structural make-up of a precast concrete joist and slab floor, a concrete tile partition, and other construction details. And throughout the interior of the house let him see the wonderfully decorative effects obtained with concrete ashlar and colors.

Model homes have proved their worth as business-getters. Through combined effort, local concrete construction groups can provide a model fireproof concrete home at every one of these Home Shows.

Clearing the Decks

The National Resources Committee has just issued *A Review of Activities and Planning* that contains material on transportation problems which has been summarized from reports of state planning organizations.

This 19-page review presents material which is attracting the attention of those who are interested in the normal and justified development of highway transportation.

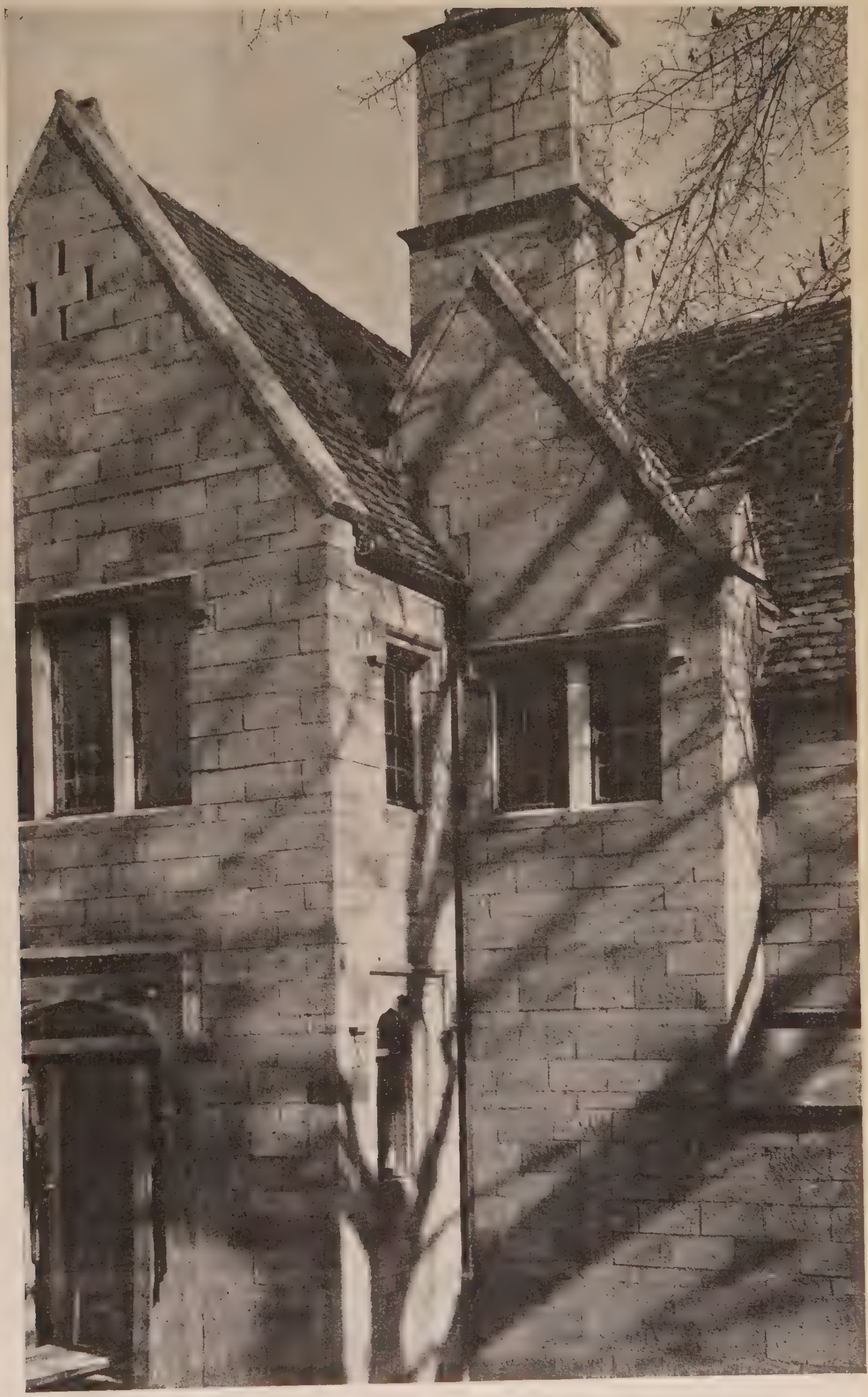
The review presents several quotations from state planning board reports which comment favorably upon continuation of highway construction and outline advantages of highway transportation.

In addition, the review quotes the New York State Planning Board as declaring that, although the state spent an average of $48,000,000 during the past four years on state highways, "a good many highways are still too narrow, or are in need of resurfacing or rebuilding."

Among the states whose planning boards recommended parkways are Kansas, Missouri, New Jersey and New Hampshire. Ten-year highway construction programs were advocated by the planning boards of Colorado, Maryland, Minnesota and Virginia.

It is evident that state highway construction, which has suffered grievously for the past few years, is clearing its decks for renewed activity.

Architectural Concrete



Hopkins and Dentz
Architects

The amazing architectural effects being obtained with concrete ashlar units is well illustrated in this close view of the walls of the new residence of L. Meinrad Mayer, at Scarsdale, N. Y. The coursed ashlar is laid up with units 8 inches and 4 inches in depth, varied with an occasional 6-inch course. Color, texture and shadow add further beauty to the treatment. Hopkins and Dentz, of New York, are the architects.

Eliminate Shrinkage in Concrete with New Vacuum Process

Draws Out Excess Water Before Setting Has Started—Heavy Air Pressure Compacts Concrete

TESTS recently conducted at Yale University under the supervision of Prof. Theodore Crane, and witnessed by highway engineers and other state highway officials, contractors, and builders, demonstrated the practicability of a new concrete-placing process developed by Karl P. Billner, for many years associated with the Aerocrete Corporation of America, and now having offices at 30 Rockefeller Plaza, New York.

Draws Out Excess Water

Recognizing that the amount of water required to obtain sufficient plasticity in the mixture is vastly greater than the quantity needed for the chemical effect of hardening, Mr. Billner, some time ago, began to make experiments with the view of overcoming or largely reducing the evil effects due to this excess water. The final result is a purely mechanical process which may be used with all types of concrete, which Mr. Billner calls the vacuum compression method.

It is based on a double action, consisting in extracting, by a vacuum process, the excess water in the fresh concrete after casting or laying, and in simultaneously compressing the concrete so as to make it dense and close up any voids due to the removal of water. This is done by placing an airtight cover on the concrete slab immediately after the fresh concrete has been placed, and creating a vacuum between the cover and concrete so as to suck out the excess water, which is drawn off by, and collected in, a vacuum tank.

One Ton Per Sq. Ft.

This compression is very considerable, depending upon the degree of vacuum; but under commercial conditions it may amount to nearly one ton per square foot. Merely to suck out the excess water without simultaneous compression would not be enough, as it would result in voids and thereby weaken the concrete.

For floor slabs, such as those used in reinforced concrete buildings and the like, and in bulk construction, such as for dams, bridges, piers, foundations, the covers will be made of light rubber mats which may be rolled out in long lengths. For road building rigid metal covers made of nicralumin will be used, for in pressing firmly upon the concrete it results in a finished surface.

Shrinkage Eliminated

The process is simple and inexpensive and may be performed by unskilled labor. The tests so far made indicate that this vacuum-compressed concrete is from 30 to 100 per cent stronger than ordinary concrete made of the same mix, the increased strength depending upon how well the ordinary concrete has been made. On the other hand, with this method it is possible to use 25 per cent less cement and at the same time obtain a stronger product and one which is technically superior.

The last-mentioned characteristic is due to the fact that the excess water is eliminated before setting, with simultaneous compression, and there is very little later shrinkage.

Time Saved

This vacuum concrete is so dense that a man can walk on it 20 minutes after it has been placed without making any marks on its surface. It can, therefore, be finished immediately. Besides this saving in time, this is a distinct technical advantage, because experience has shown that wherever a finishing coat is to be placed on previously-deposited concrete, it is desirable to apply the finishing surface as soon as possible in order to obtain a more perfect bond. In road building it will be possible to finish the concrete in one single operation, resulting in superior work and further economy.

Construction Volume in Big Gain

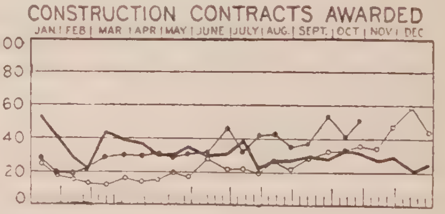
Dodge Report Says Building Industry Has Begun to Zoom—Compares Favorably with 1931

PARTLY because of private activity, partly because of the momentum of the WPA program, *the construction industry has begun to zoom*, says the F. W. Dodge Corporation in its report dated November 12. For October the volume of construction undertaken in the 37 eastern states totaled $200,863,700.

This was the highest monthly volume reported since that shown for December, 1933, the month of peak undertakings of the original PWA program. Excluding December, 1933, one must go back to the records of the autumn of 1931 to find construction totals larger than the one turned in during October. Last month's record compares with $167,376,200 for September, and it was almost 50 per cent greater than the total of $135,224,800 reported during October, 1934.

For October the residential total, as apart from other classifications, amounted to $55,100,300 in the 37 eastern states. This was more than twice the total of $26,299,800 for October of last year, and it represents a gain of more than 30 per cent over the September (1935) total. For the ten-month period ending in October residential building amounted to $394,007,800, as against $214,379,900 for the first ten months of 1934.

Practically all of this 84 per cent gain was due to private building as distinguished from housing construction of public agencies.



Heavy engineering contracts, embracing both public works and public utilities, amounted to $86,315,000 in October. This contrasts with $76,145,300 for September and $65,239,400 for October, 1934.

Associated General Contractors to Meet in Miami

Leaders See Private Construction Definitely Headed Upward—Billions to Be Spent in Delayed Construction

BELIEVING that the recent steady upward trend in private construction volume is the forerunner of a genuine revival of major proportions within the construction industry, the Associated General Contractors of America will hold their seventeenth annual convention, January 13, 14 and 15, at the Miami Biltmore Hotel, Miami, Fla., prepared to give accelerating force to this trend.

All statistical studies of past performance and future outlook published in recent issues of CONCRETE, coming from organizations such as Dodge and Brookmire, indicate that the volume trend in private construction has definitely headed upward; that it will continue upward, and that the rate of increase will be accelerated.

For the first time in more than four years, therefore, it is anticipated that the convention's major attention will be turned to this pronounced trend in *private construction*, rather than to the field of publicly financed work, upon which the industry has had to rely so heavily during the depression.

It is estimated that during the last five years an accumulated deficit of at least eighteen billion dollars in private construction has been built up. The recent upward trend may be viewed as the beginning of the break in the dam which has pent up this demand. It is a matter of especial encouragement that industrial construction is setting the pace in this movement. Residential construction, which has already shown a decided pickup, may reach boom proportions when the dam is finally broken.

William A. Klinger, of Sioux City, Iowa, and Edward P. Palmer, of New York City, have been nominated as president and vice president-at-large, respectively, to head the general contractors' national association in 1936, succeeding President Nick F. Helmers, of St. Paul, and A. W. Merchant, of Providence.

The new nominees are both outstanding figures in the construction industry. Mr. Klinger is president of the William A. Klinger Corp., prominent mid-western building contracting firm, while Mr. Palmer is secretary-treasurer of Senior & Palmer, engineering contractors who have done extensive work along the Atlantic seaboard. Both have been active in civic affairs in their communities.

Highway Research Board Program

Fifteenth Annual Meeting Covers All Branches of Highway Engineering

THE fifteenth annual meeting of the Highway Research Board, scheduled to be held in Washington, D. C., on Thursday and Friday, December 5 and 6, will be treated to a broad program comprising all branches of highway engineering. The meeting place, as in former years, will be at 2101 Constitution Ave., Washington, in the building occupied by the National Academy of Sciences and the National Research Council.

Convention Program

Following is a list of the subjects to be brought before the meeting, in papers, reports and discussions:

Highway Transportation Economics

Service Lives of Road Surfaces
Annual Costs of Equipment
Flow of Highway and Railway Traffic in Iowa
Highway Property Appraisal
Wind Resistance of Automobiles
Annual Highway Costs

Highway Design

Use of High Elastic Limit Steel as Concrete Reinforcement
Tests of Stresses in Concrete Pavements
Joints in Concrete Pavements
Brick Road Experiments in Ohio
Landslides
Effects of Trees on Wind Velocities for Snow Control

Materials and Construction

Weathering Tests of Asphalts
Needed Research in Asphalts and Tars
Sodium Sulphate Tests for Soundness of Aggregates
Effect of Freezing and Thawing on Concrete with Cements of Different Compositions
Placing Pavement Concrete by Vibration
Fillers and Cushion Courses for Brick and Block Pavements

Maintenance

Survey of Maintenance Costs
Maintenance of Cracks and Expansion Joints

Traffic and Safety

The Science of Seeing
Toll Bridge Traffic Patterns
A Master Traffic Survey in Iowa
Distance and Time Required for Passing Vehicles—Photographic Method
Safety Zones

Study of the subject-matter just listed discloses one of the broadest programs presented at the annual meetings of this organization in recent years.

Coming Conventions

***Dec. 2-7*—Chemical Industries. 15th Exposition. Charles F. Roth, The International Exposition Co., Grand Central Palace, New York City.**

***Dec. 5-6*—National Research Council Highway Research Board. 15th Annual. Roy W. Crum, Director, 2101 Constitution Ave., Washington, D. C.**

***Dec. 9-11*—Portland Cement Association. Annual. Blackstone Hotel, Chicago. Edward J. Mehren, President, William M. Kinney, General Manager, Chicago.**

***Dec. 9-12*—American Association of State Highway Officials. Annual. Miami, Fla. W. C. Markham, Exec. Sec., 1222 National Press Bldg., Washington, D. C.**

***Jan. 4-11*—National Home Show. First Regiment Armory, Baltimore, Maryland. Federal Housing Administration in cooperation with the Manufacturers' Housing Display Council.**

***Jan. 13-15*—Associated General Contractors of America. 17th Annual. Miami Biltmore Hotel, Miami, Fla. E. J. Harding, Managing Director, 222 Munsey Bldg., Washington, D. C.**

***Jan. 20-24*—American Road Builders' Assn. Annual and Road Show. Cleveland Exhibition Hall. Chas. Upham, Engineer-Director, National Press Building, Washington, D. C.**

***Jan. 21-23*—National Concrete Masonry Assn. Convention. Statler Hotel. Detroit. Horace W. Bush, Secretary and Treasurer, 211 Edgemont Place, Teaneck, N. J. D. R. Collins, Asst. Secretary, 33 W. Grand Ave., Chicago, Ill.**

***Jan. 21-23*—National Cinder Concrete Products Association. Annual. Detroit. Harry H. Longenecker, Secy., 1600 Arch St., Philadelphia, Pa.**

***Jan. 27-31*—Aggregates Associations—(National Crushed Stone Association, National Sand and Gravel Association and National Slag Association). Annual. Hotel Jefferson, St. Louis, Missouri.**

Curing Concrete Pavement with Wet Cotton Mats

Texas Highway Department Tests Result in Specifications for Mats—Used 58 Times

THE use of wetted cotton mats for curing concrete pavements has been described and illustrated in several articles in CONCRETE, particularly in the issues of September, 1933, pages 9 and 12; January, 1935, pages 19 and 20; and September, 1935, page 24.

In a recent paper presented by J. G. Rollins, division engineer, Texas Highway Department, at a short course in highway engineering given at the Texas Agricultural and Mechanical College, the author describes experiments conducted by the department to determine data on cotton mats as a curing agent.

An abstract of the Rollins paper published in *Highway Research Abstracts* (November, 1935) says the Texas Highway Department has been carrying on these experiments since December, 1933. Seven mats were made and have been used on six projects, involving 58 placements for all except one, which became unservicable after 39 placements. In this method of curing, the mats are placed after the concrete is finished, and are kept dripping wet for 72 hours.

Present specifications require the mats, after shrinking, to be 5 ft. 6 in. wide and 2 ft. longer than the pavement width. They must be composed of a single layer of cotton filler (not less than ¾ lb. per sq. yd.) made from low grade cotton, cotton linters, or such cotton waste as comber noils or card flat strips. The cotton cloth cover shall be canaburg weighing not less than 6.3 ounces per sq. yd. Mats shall be stitched longitudinally at intervals of not more than 4 in. and shall be tufted both transversely and longitudinally at intervals not more than 3 in. A 6-in. flap made of two thicknesses of cover material shall extend along one side of each mat.

Cost of curing with this method, including material and labor, has varied from 2.6 to 3 cents per sq. yd. of pavement. Lower prices are anticipated with lower prices and longer life for the mats. It was found that the ends of the mats which rested on the earth along the slab rotted much faster than the part of the mats resting on the concrete.

Flexural Strength

(*Continued from page* 15)

whether the condition would be corrected by any such adjustment.

When all the combinations had been tested and results analyzed, proportions were set up in tabular form, showing the name of the producer for each material combination, the size of coarse aggregate, water required in gallons, dry weights of fine and coarse aggregate, yield, cement factor, and specific gravity of aggregates. A copy of such a table is placed in each proposal form sent out to the contractors, so that they are enabled to make a bid based on definite information for any combination which might be used in the project. In Table 2 is shown the manner in which this information is worked up for field use, except that the *name* of the producer instead of the numerical designation is carried under the heading "Material Combinations." Since this specification has been in force, contractors, when giving proper attention to the subgrade, have been able to operate in the field within 2 to 3 per cent of the theoretical cement factor as advertised. Under this procedure the department is assured of obtaining concrete with a specified flexural strength of durable quality and the contractors are provided with information permitting an intelligent bid.

New Books and Pamphlets

Foundation Pressures

SIMPLIFIED COMPUTATION OF VERTICAL PRESSURES IN ELASTIC FOUNDATIONS, by Nathan M. Newmark, has been published by the Engineering Experiment Station, University of Illinois, Urbana, Illinois, as Circular No. 24. Paper cover, 20 pages, illustrated. Price 25 cents.

The author employs Boussinesq's formula to determine vertical pressures in foundations, but simplifies the procedure. A 2-page table of values provides a rapid method for calculating such pressures.

Minerals Yearbook, 1935

MINERALS YEARBOOK, 1935. Published by U. S. Bureau of Mines, Washington, D. C. Blue cloth binding, 75 chapters, 129 illustrations, 1,200 pages. Price $2.00.

The 1935 volume contains, in addition to accurate official data on all commercially important minerals, a resume of the principal economic developments in mining, as well as chapters dealing with progress in cement manufacture, crushed stone, sand, gravel, gypsum, lime, clay, coal utilization, uses of petroleum fuels, petroleum and natural gas production, mine safety, and mineral developments from a world viewpoint. A new chapter on miscellaneous commercial gases and another on minor nonmetallic minerals appear for the first time. Recommendations of the National Resources Board and activity under the National Recovery Administration are reviewed in the commodity discussions. Important occurrences in gold and silver mining and markets are thoroughly surveyed, supplemented by detailed reviews of activity in the metal mining districts of the various states.

Arc Welding Handbook

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE. Third edition, 1935. Published by the Lincoln Electric Company, Cleveland, Ohio. Flexible binding, 596 pages, 5½ by 8¾ in., numerous line drawings and halftone illustrations. Price $1.50.

Written especially for the use of designers, engineers, welding supervisors and operators, and containing 140 more pages than the second edition, the present volume is divided into eight principal sections dealing with (1) welding methods and equipment; (2) technique of welding; (3) procedures, speeds and costs for welding mild steel; (4) structure and properties of weld metal; (5) weldability of metals; (6) designing for arc-welded steel construction of machinery; (7) designing for arc-welded structures; and (8) typical applications of arc welding in manufacturing, construction and maintenance.

The rapid progress in arc welding is demonstrated in this book.

DETROIT IS READY!

Local Arrangements Committee All Set for Joint Convention of N. C. M. A. and N. C. C. P. A.—CONCRETE to Issue Special Convention Number

By D. R. COLLINS
Assistant Secretary, National Concrete Masonry Association
33 W. Grand Ave., Chicago

THIS is being written in Detroit, where I've been checking preparations for what promises to be the most momentous convention this industry has ever held. That convention starts exactly two months from today. If you haven't started making your plans to attend, you should do so right now. A trip to the convention will be the best Christmas present you can give yourself and your business.

A Heavy-Duty Committee

I wonder if most of us realize the hundred and one things that must be done to make a convention constructive, smooth-running and enjoyable to those who attend. To most of us, I'm sure, conventions "just happen." But back of every minute of education and pleasure you have at a meeting of this kind are hours of hard work by the committee in charge. This bunch at Detroit is no exception. Since last September they've been planning and working so that when you arrive in Detroit on the morning of January 21, you'll find a smooth-running organization ready to give you the most instructive three days you've ever known since you've been in the concrete products business.

No Speeches

You know this 1936 convention isn't going to be like any you've ever been at before. As one of the fellows remarked today, "This is going to be a convention where you see your problems solved in actual practice rather than listening to dry speeches about how they should be solved." There's going to be mighty little speaking here at Detroit on January 21 to 23. In fact, the only convention sessions, as you know them, will be held the first day. Those of the 22nd and 23rd will be held in products plants and on the job.

Painting Ashlar

A word about this first day's meeting at the Hotel Statler, which is official convention headquarters. There will be only three speakers on the program (possibly four, for the committee has a surprise number up its sleeve that it hopes to get. It will leave you gasping and cheering if they're able to get it). All of these speakers are men who have done things with concrete masonry during 1935 that have caused nation-wide comment. They're going to tell you what they've done, why they did it, and what they intend to do in the future. Then, before you leave, you're going to have an opportunity to inspect these jobs with your own eyes. Following the talks, there will be a demonstration of painting ashlar concrete masonry. This will be in charge of Herb Vincent and Roy McCandless, who probably know more about this sort of thing than anyone else in these United States. If you're having trouble getting good-looking ashlar jobs, save up your questions to ask these fellows. They'll not only answer you, but SHOW you.

Joint Convention News Letter

The first evening has been left vacant to do as you please. There is a possibility, though, that the Cinder association may have a dinner meeting that night to talk over problems of news and service. Those of you who are in cinder unit manufacture, will be welcome.

Making Joists and Ashlar Units

The second day you're going by bus to several local products plants to see ashlar units and joists made—to inspect a number of jobs where these products have been used. Machinery manufacturers have already been on the job checking their machines in these plants and have made arrangements for you to see the latest in concrete products machinery in actual operation during this trip, with both factory representatives and plant operators on the job to show and tell you how it works. This is a SHOWING convention. Both before and after the trip to the plants you'll have a chance to see some mighty fine looking jobs. So that the man who can only stay two days is going to have the opportunity of getting a bit of everything that goes on.

One feature you'll not want to miss is the banquet, on the evening of the 22nd. It will be held in the large banquet hall of the Hotel Statler. Final arrangements are nearly complete. Gene Olsen has consented to act as chairman of the Banquet Committee and is arranging an evening of entertainment that will remind many of us of the good old days in Milwaukee. This will be presented through the courtesy of the manufacturers of machinery.

Convention Number of CONCRETE

I've only given you some of the high lights. The editor of CONCRETE tells me that next month you'll be getting a big special convention issue containing the complete program. Then you'll have the complete story. Since last month, I've been as far east as New York and as far west as Wichita, have talked to prod-

See You at the CONVENTION!

"I'll be seeing you at the Convention," was the parting promise which "Spec" Collins heard from the lips of products manufacturers all over the country, from New York to Kansas, during his travels of the past month.

Wherever products men are gathered, one hears them talking about this unusual convention to be held in Detroit in January—this convention where you are going out to see things done at products manufacturing plants instead of sitting drowsily through session after session of speech-making.

What is more, products men everywhere are promising themselves—and each other—to attend.

Even at this early date—nearly two months before the meeting—it appears certain that this convention will be a record-breaker in point of attendance. That means, also, a record-breaker in point of interest and in the quantity of information carried back home.

The products man who doesn't go home from this convention with his pockets full of notes and his head full of ideas—well, it is quite unthinkable that any products man could go through those three big days in Detroit without picking up many valuable pointers.

He will see some new way of handling materials—a new piece of machinery that will improve the efficiency of his own plant—a new line of products to be added to his present output.

No products manufacturer, no matter how far he may be from Detroit, can afford to stay away from this convention.

And, while we are telling you about this great gathering, let us remind you that the January issue of CONCRETE will contain the complete and *official* program of the meeting—the only official program to be printed—and copies will be distributed at the convention.—Editor.

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ucts manufacturers from twelve states. Everyone reports business nearly double that of last year—business that is fast approaching 1929 proportions. And, in nearly every case their parting remark has been—"Well, I'll be seeing you at the CONVENTION."

And now—before someone beats me to it—let me say the same to you; and let me wish you all a

"Merry Christmas."

(Signed) "SPEC" COLLINS.

Detroit, Mich.
Nov. 21, 1935

Concrete Ash Pit

WHAT every home needs is a good method of keeping ashes in their place.

A concrete ash pit is the life-long friend of the weary furnace tender. You can throw hot clinkers and ordinary run-of-the-grate ashes into a fireproof ash pit. It won't burn, rust, or turn over. It will take plenty of rough treatment. Products manufacturers would do well to add them to their line.

The best method, probably, is to have the contractor working on other modernizing jobs fix it up. A fireproof ash pit costs very little.—*Washington, D. C., Post.*

News of the Products Industry

Concrete Fence

THE Minot, N. D., park board has approved a proposed WPA project for the construction of a concrete fence around the new Roosevelt athletic field. George Bischke is president of the board.

The fence proposed will be zigzagged like an oldfashioned rail fence, the zigzag shape offering a more stable type of construction than a straight-line wall. The plans are being prepared by George H. Bugenhagen, Minot architect.

◆

PLANS for the additions of five units to the plant of the Gray Concrete Pipe Company, Edison Highway and Duncan Lane, Baltimore, Md., have been filed with the Bureau of Buildings. According to the application for the permit the work will cost about $10,000. P. T. Bond is the architect.

◆

CONCRETE silos are being erected at the Northrup coal yard, Irvington, N. Y. Three huge structures that will hold thousands of tons of coal form one of the most modern coal storage plants in that section.

L. Thorn Company, Inc., 1319 Vincennes St., New Albany, Indiana—Winfred G. Blackiston, resident agent, 2018 Ekin Avenue—has been incorporated with a capital stock of 180 shares of no par value to manufacture concrete building blocks, drain tile, laundry tubs, vaults, and other concrete products.

Incorporators are Louis Thorn, Winfred G. Blackiston and Roland G. Blackiston.

◆

Fred B. and *Julius H. Gray* of the *Gray Concrete Pipe Company*, Baltimore, Md., have purchased a lot 218 by 891 ft., with rail connections, at the southwest corner of Eastern Avenue and Imla Street, from the Equitable Trust Company. Stamps on the deed indicated a consideration of $10,000.—*Baltimore, Md., Sun.*

◆

S. R. (Rex) Davis and J. C. Burrows are sponsoring the building of a 10,000-gallon concrete cistern at Glenwood cemetery, Beeville, Texas, and are receiving contributions to a fund necessary for its construction.

Build Walls of Precast Concrete at Half the Cost of Masonry

IN the article entitled *Precast Walls of Pump House Raised Into Position,* appearing on page 4 of the September issue of CONCRETE, no reference, unfortunately, was made to the fact that the pump house described was designed by Howard T. Blanchard, a Garden City (Kansas), architect.

Additional information of an extremely interesting character, pertaining especially to the economy of this type of construction, has been received from Mr. Blanchard, who writes:

"This unusual bit of construction was done in connection with an engineering project on which C. W. Suit was consulting engineer; however, as for the design of the pump house to which you refer, I was called in by Mr. Suit as associated architect to design a building which could be prefabricated out of concrete at a minimum cost. This I was able to do, and later as associated architest, I designed the bath house at Satanta, Kansas, to which this same article refers.

"Mr. Suit and I are both quite proud of our results, partly because we were almost two years ahead of the prefabricated concrete buildings of Washington, D. C., which are now gaining national recognition, but mainly because we had discovered a construction which would utilize a maximum amount of common labor at a great saving to the owner (about 50 per cent in the case of the pump house, compared with the lowest bid for usual masonry construction)."

Prefabricated reinforced concrete walls of pump house built at half the cost of ordinary masonry walls

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American Association Plans Future of Engineering Profession

Individual Engineers Should Take More Interest in Civic Affairs—Annual Convention Develops Program

PLANS for the rehabilitation of the engineering profession as a whole, and individuals of the profession as well, were discussed at the annual meeting of the American Association of Engineers, held in Chicago on November 4, 5 and 6. Specific items in the plan of future action include—

(1) Complete classification of all engineering positions; specifications for every type of position; minimum salary schedule in every field.

(2) A national clearing house for engineering positions; unified placement service with efficient regional offices. Close co-operation with industry and governmental agencies employing engineers.

(3) Formulation of specific principles of good professional conduct to be made official by all engineering organizations; governing engineers in private practice and employed men equally.

(4) Legislative program including uniform licensing laws; protection of the title; and development of enforcement agencies in the profession comparable to those of the medical profession.

(5) Recommendations in engineering training including emphasis on vocational guidance and incorporation of business courses in curricula.

(6) Comprehensive legal service.

(7) Development of a recognized agency for handling public relations of the profession, including publicity, and more aggressive participation by engineers in civic affairs.

(8) Creation of a Welfare Foundation, financed by a large enough membership to cover unemployment insurance, accident insurance for all members, and annuities and pensions.

Victor Housholder, of Phoenix, Ariz., who is an international trustee of Kiwanis International, and a director of the American Association of Engineers, told the convention that if the engineering profession is to rehabilitate itself, individual engineers must take more interest in civic affairs. This has become increasingly necessary because much of the program for our future national development involves projects in which engineering is the important factor. Engineer-citizens are under a greater obligation than others to understand thoroughly and to identify themselves with political and civic organizations interested in local, state, and national projects included in this whole program.

The American Association of Engineers is at 8 So. Michigan Blvd., Chicago. M. E. McIver is national secretary.

Low Cost Concrete House

AN inexpensive concrete dwelling designed in Cape Cod style has been completed by Everett Burbank on South Church Street, Bedford Hills, Westchester. The house, with concrete walls, floors and roof and metal sash throughout, cost $4,200, according to the builder.

There are four rooms and bath on the first floor and space for two rooms on the second. The basement is partitioned for a work room, a laundry and coal storage. Both floors are entirely fireproof, being of concrete joists and cinder concrete slabs with a finishing coat of mortar. The under side of the second floor provides the ceiling for the first, with paint applied directly to slabs and exposed joists.

Exterior walls are of 8-in. cinder concrete units, with waterproof paint applied inside and outside. Partitions are 4-in. cinder units similarly painted.

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(H.) How to Do It.
(P.) Progress—In a Page.

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House of Health—How to Build It, by Odd Albert. May 28.
Joints for Concrete Pavements, by L. J. Mensch. Feb. 26.
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Minerals Yearbook, 1935. Dec. 20.
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A Selected Bibliography on Housing. Oct. 28.
Simplified Computation of Vertical Pressures in Elastic Foundations, by Nathan M. Newmark. Dec. 20.
Slums and Blighted Areas, by Edith E. Wood. Nov. 28.
Tables for Control of Concrete Mixes by Weight (Seeger-Aggragraph). Sep. 28.
Tractive Resistance as Related to Roadway Surfaces and Skidding Characteristics of Automobile Tires on Roadway Surfaces. Feb. 26.

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Quantities in Concrete Bridges Can Be Estimated, by Dr. J. A. L. Waddell. April 16.
First Rigid-Frame Highway Bridge in Texas, by G. G. Wickline, Bridge Eng. Oct. 5.

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Brookmire Sees Construction Revival. June 10.
Construction Contracts Continue Increase. Sep. 18.
Building Outlook Bright. Nov. 20.

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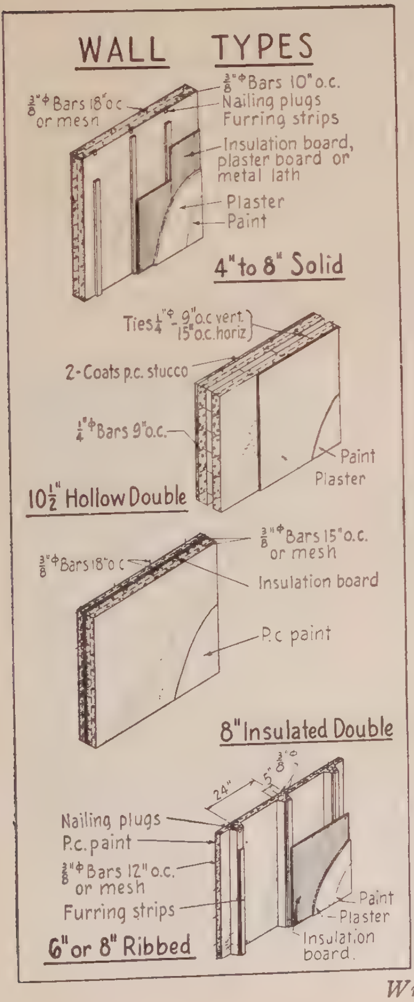
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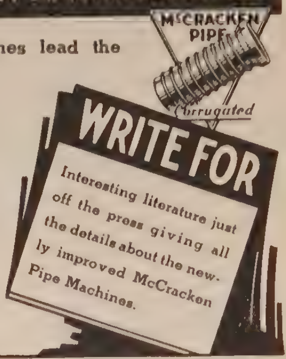

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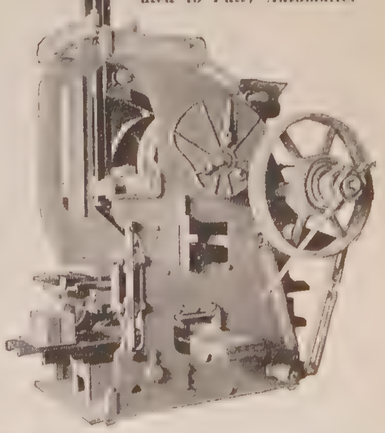

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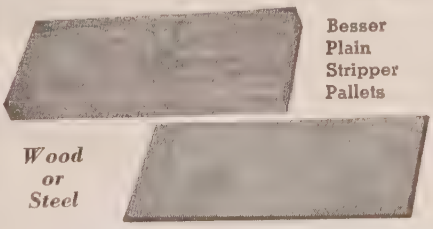

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JOINT MEETINGS of Aggregate Associations

Triple-Headed Conventions in St. Louis to Have Joint and Separate Sessions—Machinery Exhibit

CONCURRENT annual conventions of the National Crushed Stone Association, the National Sand and Gravel Association, and the National Slag Association will be held during the week of January 27, 1936, at the Hotel Jefferson, St. Louis, Mo.

The decision to hold concurrent conventions was based upon the recognition that this would facilitate the handling of those problems of the industries in which there is a mutuality of interest.

One day will be devoted to a joint program and further announcements will give the details of the events scheduled for that day. The three Associations will announce the program which they will arrange for the separate sessions of their individual organizations.

An added feature of the convention will be a machinery exhibit jointly sponsored by the National Sand and Gravel Association and the National Crushed Stone Association. This has always been an interesting and instructive feature of these annual meetings, and this promises to be unusually true at St. Louis in the light of the general expectancy that 1936 will witness an emphatic stimulation in the sand and gravel and allied industries. This suggests that superintendents and operating men should come to the convention, because the machinery exhibit is designed to appeal particularly to them.

The first day of the convention, January 28, will be devoted to a program, including reports on business conditions throughout the country. Economic and engineering problems affecting the aggregates industries will be examined and discussed and the reports of Association officers will be received.

Wednesday, January 29, will be set aside for the use of the newly-organized Mineral Aggregates Institute, and the addresses and floor discussions will bear upon those questions which are of common concern to the sand and gravel, crushed stone and slag industries, including such matters as voluntary codes, industry agreements, local organization, federal legislation, governmental production, and the like. On that evening the three organizations will hold a joint banquet, at which a speaker of national prominence will address the groups on efforts of industry to achieve stabilization under existing law. The balance of the program will consist of entertainment, including an orchestra and floor show.

Agricultural Engineers Meet

● Farm Structures Division to Have Interesting Program in Chicago Convention

THE American Society of Agricultural Engineers will hold its annual meeting at the Stevens Hotel, Chicago, on December 2 and 3.

Among the various divisions of the society, the farm structures division will have a program of most value to the concrete construction industry.

Wm. G. Kaiser, manager of the cement products bureau of the Portland Cement Association, will present a paper on *Recent Developments in Concrete Construction Applicable to Farm Building Requirements.*

A round-table discussion on *Co-operative Farm Building Plan Services* will be led by Henry Giese, of Iowa State College.

Another round-table discussion, led by Wallace Ashby, of the U. S. Bureau of Agricultural Engineering, and E. G. Boerner, of the U. S. Bureau of Agricultural Economics, will cover the subject of *Safe Storage of Grain Under Seal on the Farm.*

Raymond Olney is secretary of the American Society of Agricultural Engineers, St. Joseph, Michigan. K. J. T. Ekblaw is chairman of the farm structures division.

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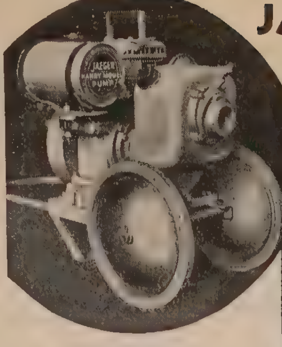

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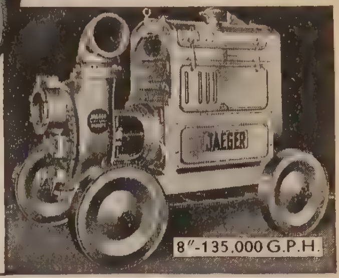

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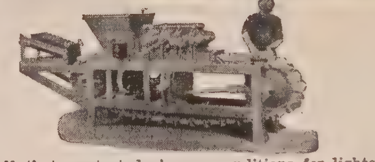

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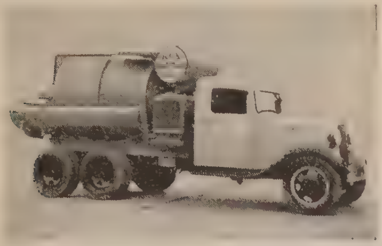
EQUIPMENT AND MATERIALS

THORNTON TANDEM CO., Detroit, announces a new unit for Ford and Chevrolet 1½-ton trucks which they say, enables them to carry pay loads comparable to those of heavy-duty trucks, yet maintain the lower light truck economy. It is known as the Thornton Dual Ratio Four Rear Wheel Drive.



Truck equipped with Thornton unit

●

THE HYDRAULIC CARTRIDGE is said to be a new, safe and economical method of demolishing old concrete work or rock. The breaking is said to be easy—no sudden yielding or shock—so that old foundations may be removed without interfering with, or damaging, adjoining machinery. A four-page illustrated folder is being distributed by Hydraulic Concrete Breaking Co., Detroit, Michigan.

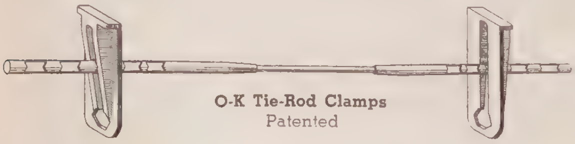
●

O-K Tie Rod Clamps are an improved wedge type of concrete form clamp being manufactured by Construction Accessories, Inc., Chicago, Illinois.

The special feature of O-K tie rod clamps is that a hammer is the only tool used for either clamping the forms or removing the clamps from the forms and concrete. They function for both form tie and spacer and leave the stud bolts cut back of the surface of the concrete wall for rust-proof and waterproof finish.

They are made for heavy duty on waler type of concrete wall forms, using threaded stud bolts or tie rods for the section left in the concrete. They are furnished in sizes for use with ⅜, ½, ⅝ and ¾-in. threaded rods.

The Tie-Rod Bars are made of machined steel, case hardened throughout to insure long wear of both wedge lugs and interior threads in cone end. The wedge plates are malleable iron, and designed of sizes to give proper bearing on wood walers at any angle of use.



O-K Tie-Rod Clamps
Patented

AYRGO material cart is a new design for use in manufacturing plants and on construction work.

The cart has a liquid volume of 11 cu. ft. On construction projects it will handle the entire batch of a No. 10S mixer. It is designed for a total load of 1,900 lb., the net weight of the cart being 250 lb.

The body is of steel sheets electrically welded, and it is equipped with all steel wheels, Timken roller bearings, 5.00 x 15 pneumatic tires, and full control handles. The design of the handle and balanced arrangement of this cart—body with respect to the wheels—permits one man, they claim, to handle a capacity load in loading, moving or unloading.

The Ayrgo material cart

The cart is being manufactured by the Pittsburgh-Des Moines Steel Company at both Des Moines and Pittsburgh, under license from the Omaha Trailer & Equipment Company.

●

THE MASTER mixer manufactured by the Concrete Transport Mixer Co., St. Louis, Mo., is now available in 1 and 1½-cu. yd. capacities.

The mixer has both side and rear discharge, making it adaptable to various concreting operations. Revolving helical blades serve to mix and discharge the concrete at the desired rate, they claim. The mixer is operated from the truck motor, by roller-bearing power take off adaptable to any make of truck, with variable speeds from 1 to 20 r.p.m. The conditioning of the mix by agitation with slow blade motion during delivery, they say, increases strength.

Manufacturers' News

GEORGE B. PICKOP, president and treasurer of the New Haven Vibrator Company, Inc., New Haven, Connecticut, announces the purchase of the vibrator business from the Malleable Iron Fittings Co.

Mr. Pickop announces his new company will manufacture the entire line of concrete vibrator equipment formerly manufactured by the Malleable Iron Fittings Company with new types and sizes added to the line.

●

LUBRIPLATE lubricants, offered by Fiske Brothers Refining Co., New York City, are recommended by the manufacturers as a protection against rust and corrosion, with long life for contractors equipment.

Fluid friction and viscosity are subjects of the Lubriplate Film No. 3 (November, 1935).

●

THE FULLER COMPANY of Catasauqua, Pennsylvania, has acquired the exclusive rights to the Fluxo system for conveying cement and other pulverized materials, in the United States and possessions, Canada and Mexico, from F. L. Smidth & Company.

●

W. H. MAZE CO., Peru, Ill., claims seven of the large roll roofing manufacturers are packing their new spiral nail in their roll roofings. This roll roofing fastener was recently patented and is suitable for use with cement-asbestos roofing shingles.

Industrial Literature

CONCRETE Curing with Hunt Process is the title of a 20-page book just received from the Johnson-March Corporation, New York City, containing curing data which they say was compiled from an investigation of bituminous curing conducted by the Civil Engineering Testing Laboratories of Columbia University.

There are illustrations of particular job applications and specifications.

●

COLT'S Clamps catalog No. 52—contains illustrations, description, size, reach, price and approximate weight of all styles—eccentric or screw—manufactured by the Batavia Clamp Co., Batavia, N. Y.

Vol. XLIII
No. 12

Cement Mill Section of
Concrete

December
1935

New Wet-Process Plant in Idaho Starts Operations

First Shipments in Late October—Huge Reserves of Raw Materials at Orofino—To Consolidate Operations with Lime Plant

IDAHO'S second cement manufacturing plant, located on the Clearwater River, just east of Orofino, near the Idaho-Washington state line in the northern arm of the state, has been put into operation by the Washington-Idaho Lime Products Company, of Spokane. The only other cement plant in Idaho is the one at Inkom, in the southeastern part of the state, owned by the Idaho Portland Cement Company.

Wet Process Plant

The new plant at Orofino is operated under the wet process and is designed for an immediate capacity of 400 bbl. daily; but the layout is planned so that the addition of a small amount of equipment will permit doubling of the production.

All of the raw materials except coal and gypsum are obtained from the company's deposits adjacent to the plant. The entire layout is arranged so as to require the least possible amount of rehandling of material.

An unusual feature of the plant arrangement is seen in the advantage taken of the topography of the ground. The plant site is on a flat area of land at the foot of the hill from which the raw materials (limestone and shale) are quarried. By opening the quarry well up from the foot of the hill, it was possible to provide gravity flow from the quarry into the slurry tanks.

The mill is served by a spur from the Camas Prairie Railroad.

Operations Are Started

Fig. 1 shows the plant in an unfinished state so far as final construction work was concerned—but ready, nevertheless, to start the production of cement. This view illustrates the plant as it was in early October. The quarry had then been in operation for several weeks, and raw grinding had been carried on long enough to fill two of the four slurry tanks, which may be seen near the stack. The last of the four slurry tanks was then under construction. At that time, also, the temporary cement storage silos had not been completed, and the pack house was not quite finished.

Operations were started in the quarry about the middle of September. The primary crusher was started early in October; and a few days later the 125-ft. kiln was started. By the end of the month an imposing quantity of clinker had been piled up. Clinker-grinding operations were begun a few days before the end of October, and the mill's first shipment of standard portland cement (the equivalent of five carloads) was made at that time, partly by rail and partly by motor truck.

Quarry Operations

Fig. 2, from a photograph taken early in October, shows quarry operations under way, with a 65-ft. conveyor discharging the product of the hammer mill into the raw material storage bins.

Because of the short distance from the initial quarrying operations to the crushing plant, no industrial locomotive equipment or quarry track cars are employed for the present. The company has such equipment available and will install it when greater distance to the crushing plant warrants such action. For these first operations a 20-B Bucyrus shovel loads into Ford dump trucks, which have only a short haul to the crusher chutes. Among the other quarry equipment is a Worthington portable compressor and two No. 36 Worthington drills. The company has recently

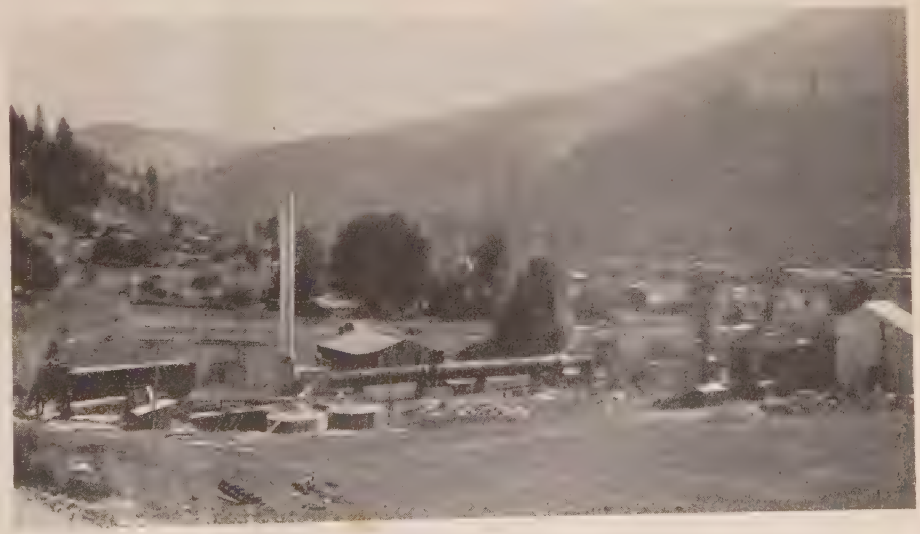


Fig. 1—New cement plant at Orofino, Idaho, starting operations. Two of four slurry tanks are filled, and the kiln is ready to be started

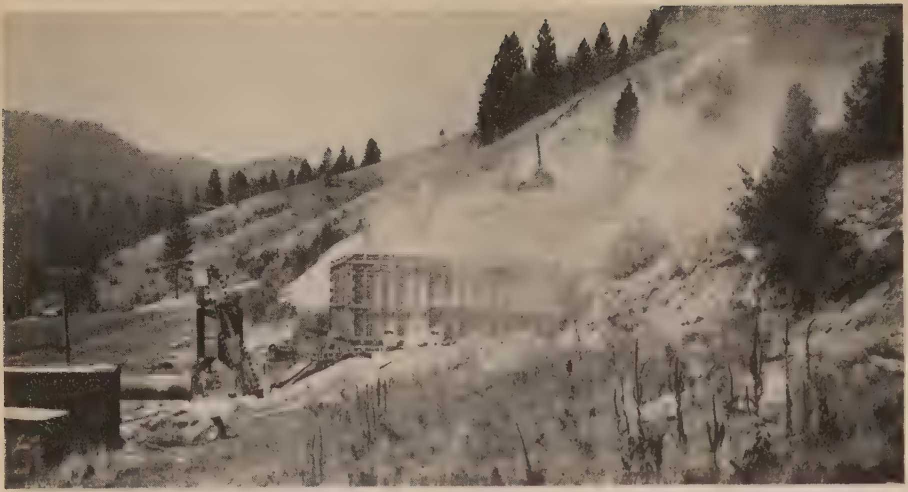


Fig. 2—Quarry operations under way. Conveyor delivers product of hammer mill to raw material storage bin

changed to the use of Crusca detachable bits, and is getting excellent results with them.

Big Deposits of Raw Materials

The quarry is located at the north end of the company's property, and is cut into the side of a veritable mountain of limestone and shale. In addition, a nearby deposit of iron ore is available.

The deposit of limestone and shale has been opened up for a considerable distance across the property, and the company has done considerable development work upon the quarry faces. In consequence, material is now being handled from the quarry into the primary crusher chute at a minimum cost.

The reserve of raw materials seems almost unlimited: but aside from this deposit adjacent to the mill site, the company also controls another deposit of similar material at a point about three miles distant. located on the same railroad.

Crushing and Raw Grinding

At the crusher plant the chute from the quarry level discharges by gravity into a 9-in. by 36-in. Universal crusher, which in turn discharges onto a short feeder belt that delivers the primary crusher product to a Jeffrey Eureka type hammer mill. The hammer mill discharges onto the 65-ft. conveyor seen in Fig. 2, by means of which the finely crushed rock is carried to the raw material storage bin.

From this storage bin, the raw material is discharged onto another conveyor, which carries it to an elevator that feeds a 5-ft. by 20-ft. rod mill manufactured by the Colorado Iron Works.

The slurry is discharged from the rod mill and conveyed by gravity through a trough which feeds into four slurry storage tanks, two of which may be seen filled in Fig. 1, near the stack. The slurry pumping system provides for transferring and blending the slurry and delivering it to the two kiln feed tanks, and also for transferring from the kiln feed tanks to the feeder.

Coal is handled from railway cars into transfer storage, elevated to a feed bin, from which a Raymond Brothers impact pulverizer takes the coal for grinding and injection into the kiln.

The Kiln and the Cooler

Fig. 1, as previously stated, shows the plant as it was just before the kiln was started. The Vulcan rotary kiln is 125 ft. long. For 70 ft. of its length, the diameter is 7 ft., and 7½ ft. in the remaining length.

The kiln discharges into a rotary cooler which was rebuilt for the purpose by the General Machinery Company, of Spokane, Wash., using as a nucleus a chemical dryer obtained from a dismantled chemical plant. The reconstructed cooler is operating perfectly. It discharges onto a conveyor that carries the clinker to an open air storage pile.

The Finished Product

From the storage pile a belt conveyor transports the clinker to the crushing rolls, at which point the gypsum is introduced. The crusher rolls discharge into two Colorado Iron Works rod mills of the same size and design as the raw mill. The finished cement is then elevated from these rod mills to the top of the cement storage bins, where it is discharged into a screw conveyor for delivery to the proper bin. Cement is drawn from the bins, and delivered by means of a screw conveyor to the packer tubes. The final packing is performed by a Bates valve packer.

To Consolidate Cement and Lime Plants

The property on which the new plant has been constructed was at one time owned and prospected by the Orofino Portland Cement Company, but that company did not erect a plant. This prospecting work was done in 1913. Recently the Washington-Idaho Lime Products Company, builders of the plant here described and illustrated, acquired this cement property; and at about the same time they acquired the property of the Clearwater Lime Products Company, a lime producer located three miles up the Clearwater River from Orofino.

The two plants are being consolidated as rapidly as the work can be done, and the lime plant is being rehabilitated with the view of producing various limestone products, as well as various grades of quick lime and hydrated lime for building, chemical and agricultural purposes.

Acknowledgments

E. J. Simons, president of the Washington-Idaho Lime Products Company, was active a few years ago in the construction of the Idaho Portland Cement Company's plant at Inkom, Idaho, near Pocatello. Burton B. Pierce, who was employed in the construction of the plant at Inkom, is superintendent of construction of the new plant at Orofino. Mr. Pierce has had wide experience in the construction and operation of cement plants, having been connected at various times with the Oregon plant at Lime, Oregon, the Northwestern plant at Grotto, Washington, and others.

More Cement Imports from Denmark

DANISH exports to the United States for the period from May to September, 1935, amounted to 23,164 short tons, representing a 140 per cent increase as compared with the corresponding period of 1934, due to the trade agreement which went into effect between the United States and Belgium on May 1, 1935. Denmark has benefited largely through the decrease in duty, without in any way granting concessions with respect to its own import trade from the United States.

LEPOL KILN MODERNIZES

Old Shaft Kiln Plant

How an Old Cement Plant in Italy Was Renconstructed—First Lepol Installation in America to Be Described in Next Issue

IN practically all European countries today the capacities of the existing cement manufacturing plants exceed the demand for cement. At the same time the demand for higher quality cement has greatly increased. For these reasons many old cement plants in Europe have been forced to reorganize and modernize their plants in order to reduce production cost and to produce a higher quality of cement. In this article an interesting example is given of how this was accomplished recently in an Italian cement plant.

Old Plant Operated with Shaft Kilns

Up to the time the plant in question was rebuilt, it operated with manually-discharged shaft kilns, of which one can still find quite a number in Europe today. The raw material consists of limestone-marl which needs only slight corrections to make it suitable for the manufacture of portland cement. Through proper selection of the different strata within the quarry the mix of the raw material is properly kept within the desired limits.

New Plant Has Capacity of 1,200 Bbl.

With the modernization of the plant a capacity of 1,200 barrels per day was provided. Following the suggestion of the company which delivered the machinery, the dry process was used. The reconstruction of the plant was designed to take into consideration the local conditions, with the existing buildings and machinery, which were to be made use of as far as possible. Fig. 1 shows that, despite existing difficulties, a practical and satisfactory solution was found. In addition, provision was made so that the modernized plant can easily be increased to double the present capacity, and this can be done without interrupting operation. The buildings of the modernized plant are of reinforced concrete, which type of construction is now generally preferred on account of its known advantages; and in addition, it is admitted to be the best form of advertising to induce other builders to use concrete in their construction.

Preliminary Crushing by Zet Crusher

The raw material is transported from the quarry to the crushing plant by means of an aerial tramway. The crushing plant, consisting of a so-called *Zet* crusher with feeder, is located above the feeding hopper of the raw material grinding mill. The feeding to the crusher is done by means of a grizzly feeder, which assures a very even feed and which greatly increases the efficiency of the crusher. The grizzly feeder discharges the small particles and fines through its bars directly into the raw material storage silo. The *Zet* crusher is a modern type hammer mill which, in the plant here described, reduces 20-in. pieces to pieces 1 in. in diameter and under. The capacity per hour is 100 tons, and the power consumption is about 100 hp.

First Lepol Kiln in United States

THE January "Cement Mill Edition" of "Concrete" will contain an authorized description of the first Lepol kiln installation in the United States—in the Pacific Northwest.

This first American unit is the same size and capacity as the Italian installation here described. The January article will not only describe the mechanical details of the American installation, but — of far greater importance — it will present the actual performance records being obtained under regular operating conditions.

Readers are referred also to a detailed description of the Lepol system in a series of articles by T. H. Arnold, published in the "Cement Mill Edition" of "Concrete" in April, May and June, 1932.—Editor.

The crushed raw material needs no further reduction before entering the grinding mill. The flexibly-mounted hammers of the crusher are made of special hard steel and can easily be turned in case one side of the hammer surface becomes worn. Before the raw material enters the interior of the crusher it has to pass through a retaining grate through which the hammers strike, breaking the large pieces down to the size required to pass into the interior of the hammer mill. In the interior of the hammer mill the raw material is again exposed to the crushing action of the hammers. The crushed raw material falls through an adjustable grate from the inside of the crusher to the crushed raw material storage silos. The *Zet* crusher is strongly built; the housing is made of steel, the upper part of which can easily be removed for inspection. The crushing chamber is lined with especially heavy-duty steel lining plates. The steel shaft runs in large oil chamber bearings with ring lubrication. Fig. 2 shows the crusher with the grizzly feeder.

Drying and Grinding in One Mill

The drying and grinding of the raw material are done in an air-swept drying and grinding mill which has a capacity of 17 tons per hour with a fineness of 81 per cent through the 200-mesh sieve. This fineness will undoubtedly be considered low compared to the usual American practice. However, this fineness is determined by the fact that the burning is done in a so-called Lepol kiln, and one of the advantages of this kiln is that in many cases savings can be accomplished because the raw material need not be reduced to the fineness necessary in other types of kilns. That the cement produced is of high quality is shown later in this article by the results of the compressive and tensile strength tests.

Because the air-swept drying and grinding mill has shown excellent results, its use in the last few years has been extended quite rapidly. Three separate functions are done in this machine unit — namely, grinding, drying, and separating, giving the mill a very high efficiency (Fig. 3). The installation of the usual drying drums and special separators is done away with. The air-swept grinding and drying mill is a

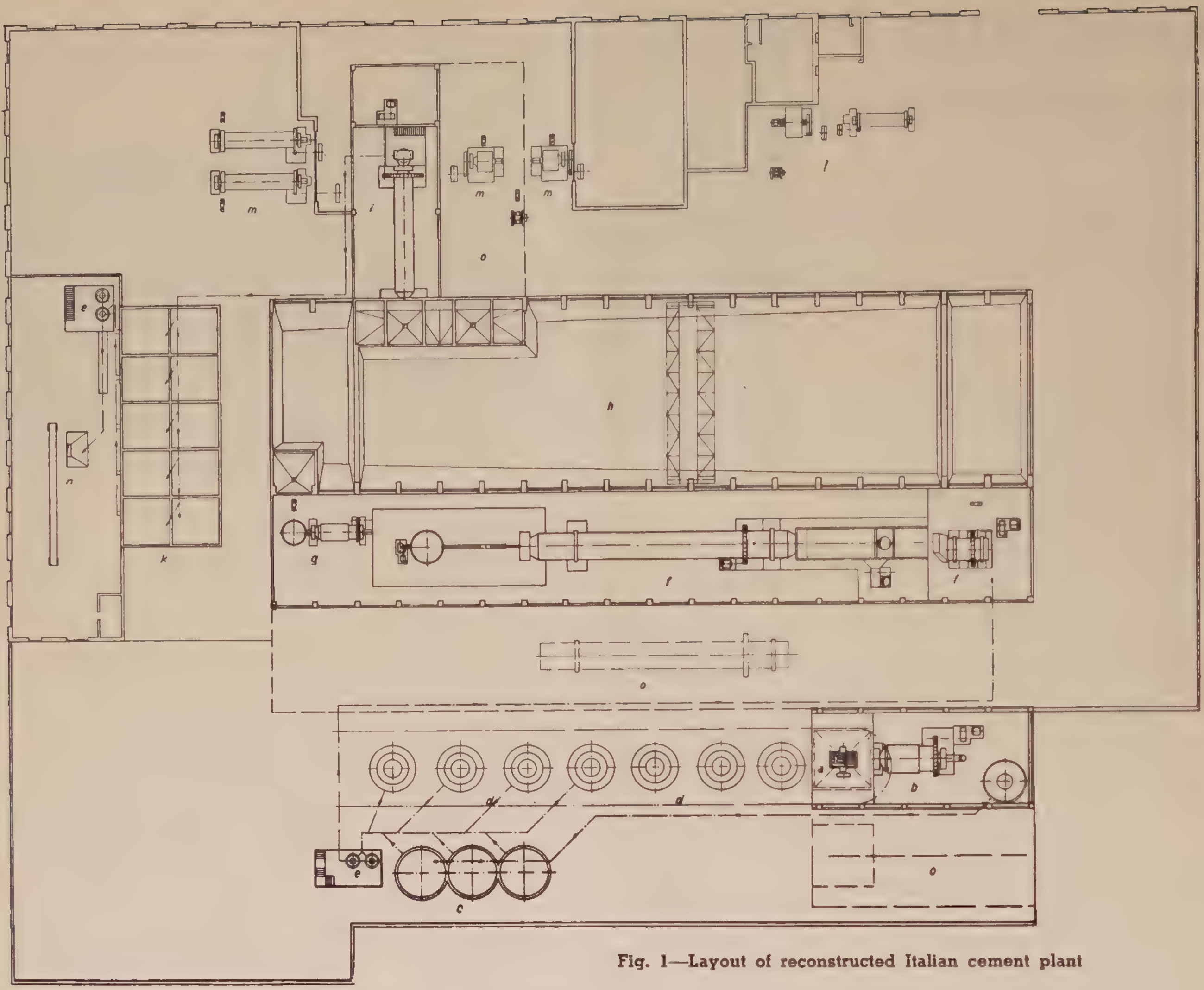


Fig. 1—Layout of reconstructed Italian cement plant

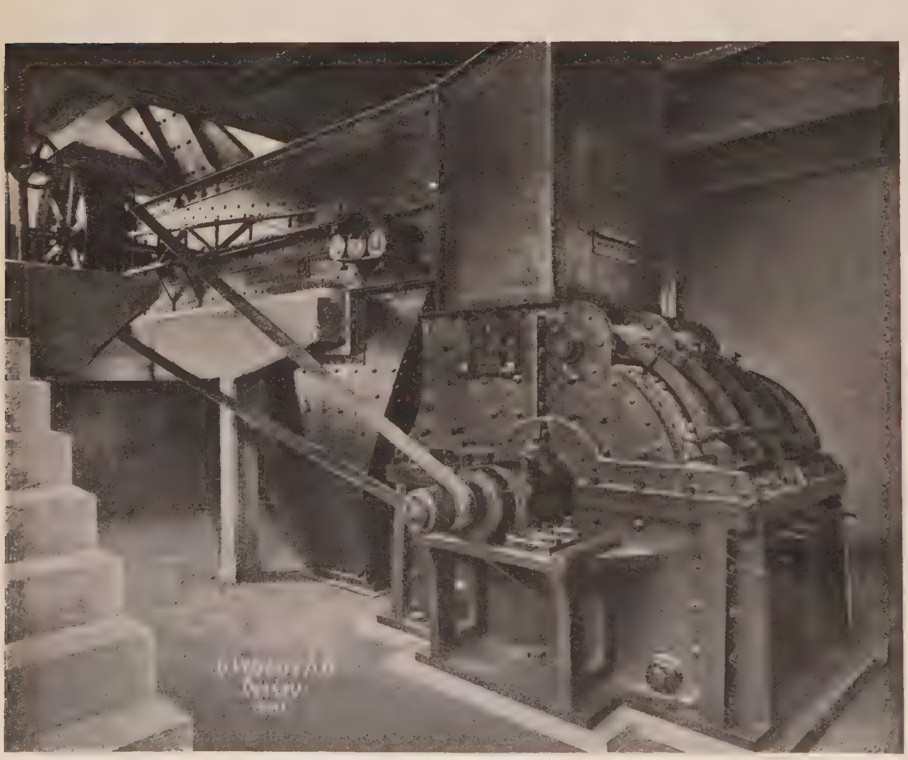


Fig. 2—Crusher, with grizzly feeder

short tube mill of rather large diameter. This tube mill is divided into two grinding compartments and one separating compartment. When in operation, hot air is sucked through the mill and it dries the raw material within the grinding compartments. A simple device inside the separating compartment separates the tailings out of the fines and recharges them into the grinding compartments for further grinding. The fines leave the mill by means of an air current and are settled in a collector bin. Part of the air current employed is reheated and operates in circuit, while the remaining air, after passing through a dust collector, is discharged dust-free into the open. Inasmuch as the whole unit works at low pressure, dust nuisance is impossible.

Pneumatic Conveying for Ground Raw Material

The conveying of the ground raw material to the mixing silos is done by means of a pneumatic *Cera* pump. This pump is especially designed for use in the cement industry, but it conveys all

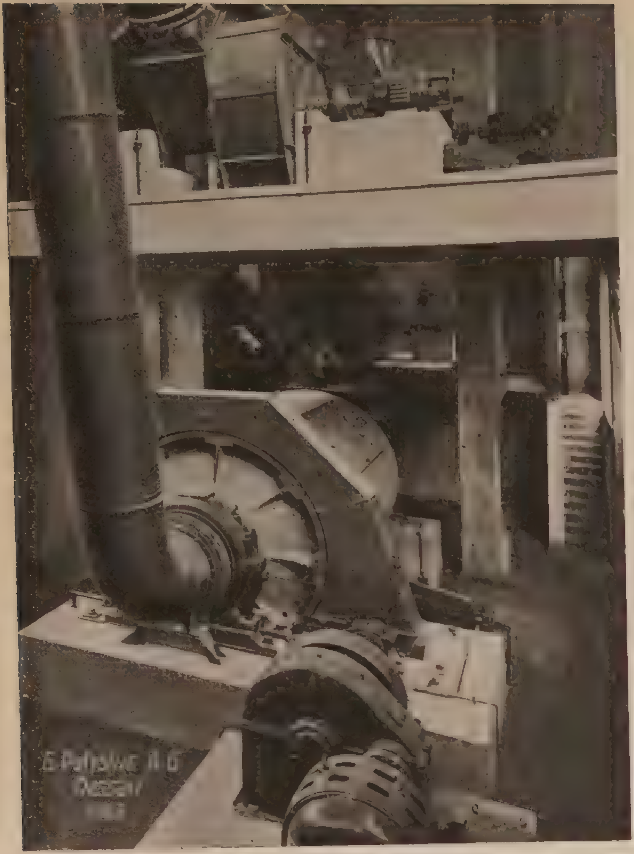


Fig. 3 (Left)—Air-swept drying and grinding mill performs three functions — drying, grinding, and separating

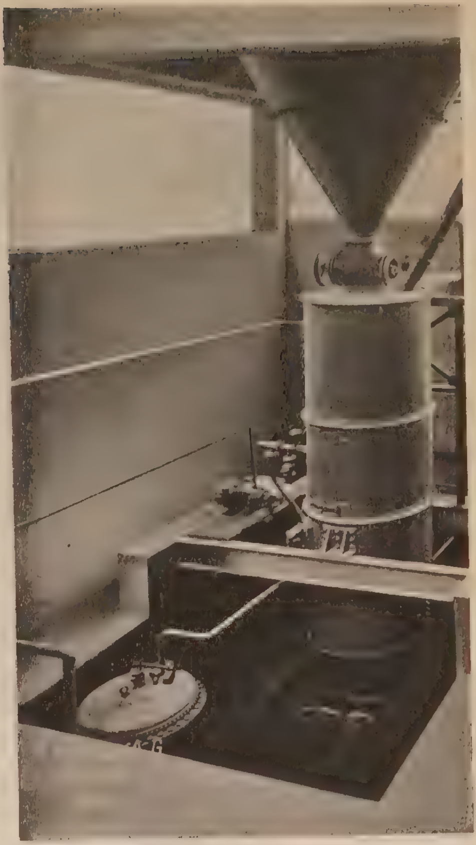


Fig. 4 (Right) — Pneumatic pump conveys raw meal to bins

kinds of dusty and pulverized bulk materials. Of special advantage in this conveying machine is the exclusive use of compressed air for conveying the material. No moving parts, such as screws, are employed in this pump. The raw material flows into the pump by gravity. The raw material, therefore, does not come into contact with mechanically operated parts, and so the pump is practically without wear and tear, thus operating with an extremely high degree of dependability (Fig. 4).

The pump consists of a single pressure container located right under the collector of fines of the above-described air-swept drying and grinding mill. The pressure container holds approximately 20 bbl. of ground raw material. As the conveying starts, the raw material flows through an open gate into the pump. As soon as the filling is completed, an automatically controlled governor closes the gate and compressed air enters which, after automatically opening a valve, conveys the raw material through the conveying piping into the mixing silos. After emptying the pressure container, the compressed air is automatically shut off and the filling starts anew. The whole operation is completely automatic and is governed by a gauge indicator on the pump container. By means of this type of automatic control, any decrease in the capacity does not affect the efficiency. A desired decrease in conveying capacity might occur in case of reduced production; but with this type of pump the air consumption in relation to conveyed material remains always the same. The *Cera* pump itself needs no motor power for its operation, so that for calculation of the power consumption only the power needed for the compressor is taken into consideration.

Fluidify the Ground Raw Material

The blending of the ground raw material is done in three silos, each having a capacity of approximately 2,000 bbl., by means of a new and very ingenious process. With this process compressed air is blown by special devices from the bottom of the silos into the raw mate-

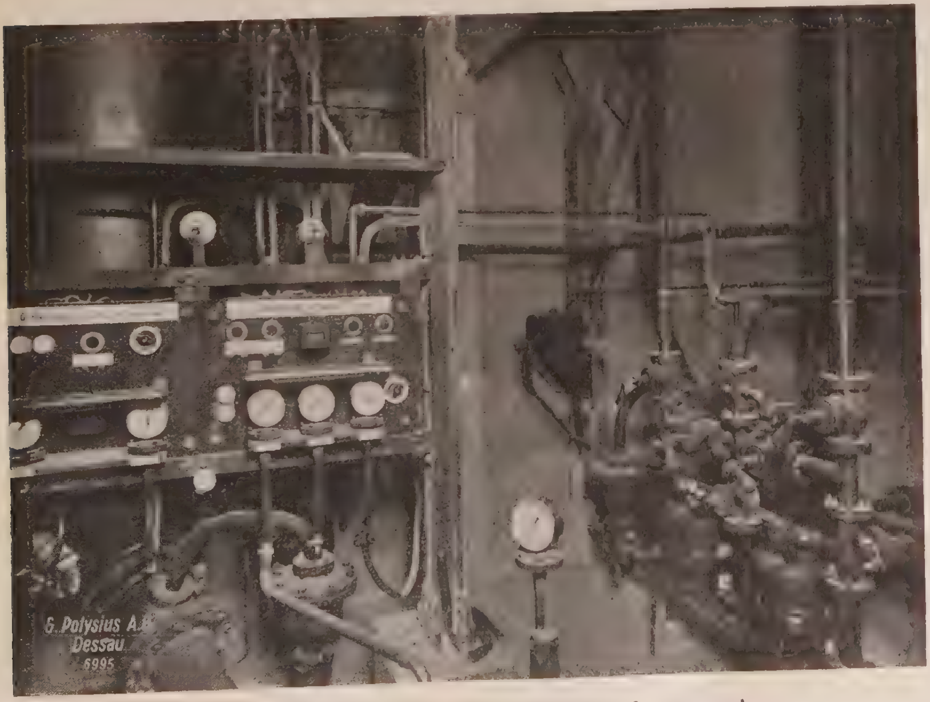


Fig. 5—Aerating devices and pneumatic discharge spouts

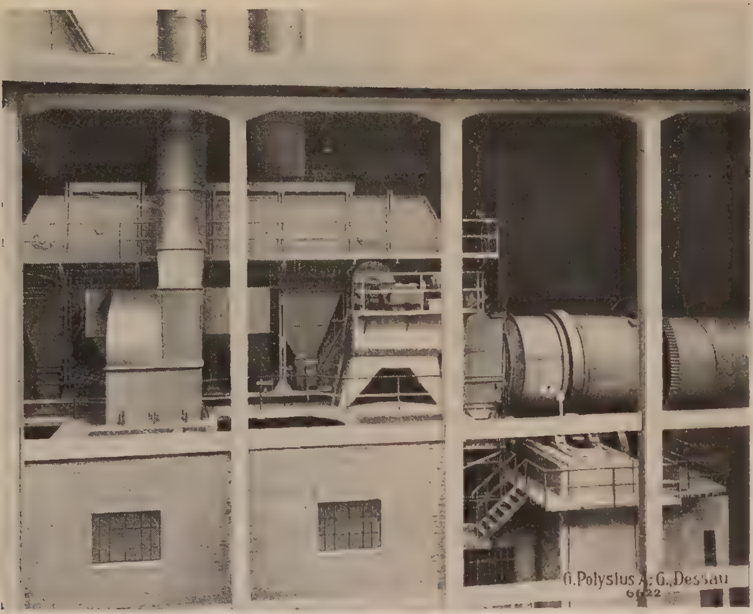


Fig. 6—Traveling grate of Lepol kiln is shown in the upper left-hand part of the illustration. The grate discharges into the short rotary kiln at the right

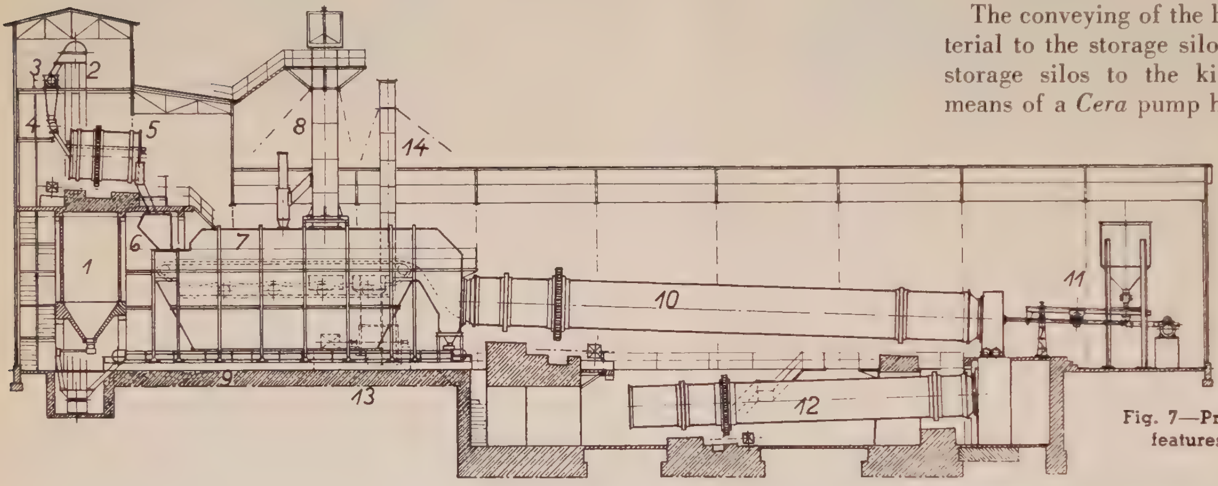


Fig. 7—Principal details and features of Lepol kiln

rial, saturating it with air in a very short time and bringing it into a highly fluid state.

These so-called air boxes, which are installed on the bottoms of the silos, distribute the compressed air through porous material in very small bubbles into the raw material. This aerating of the raw material is done in a few minutes and then the proper condition for the actual blending is created. The mixing within the silos is performed by means of a series of pipes which are vertically arranged and distributed over the surface of the silo area, and which extend for different lengths into the raw material. At the lower end of each of these pipes a compresesd air connection is provided. The upper ends of the mixing pipes are bent toward the center of the silo. As soon as the material is aerated the compressed air connections of the mixing pipes are put into operation, and the material flows upwards through the pipes, discharging in the upper part of the silo toward the center.

Thus a continuous flow of raw material from different strata is maintained until the desired accuracy of blending is attained. It is readily understood that this mixing device produces an accuracy in blending which was only possible before when mixing wet raw materials. Differences in the chemical composition of the raw material can be eliminated to plus or minus 0.2 of one per cent. The decided advantage of this blending system is not only its accuracy, but also the small amount of compressed air necessary for the mixing. After the mixing is done the blending device can be shut off, since segregation or settling does not take place. When a silo is mixed, it stays mixed. Another advantage is that no moving parts come into contact with the raw material, so that practically no wear and tear need be reckoned with.

The conveying of the blended raw material to the storage silos, and from the storage silos to the kiln, is done by means of a *Cera* pump having two pres-

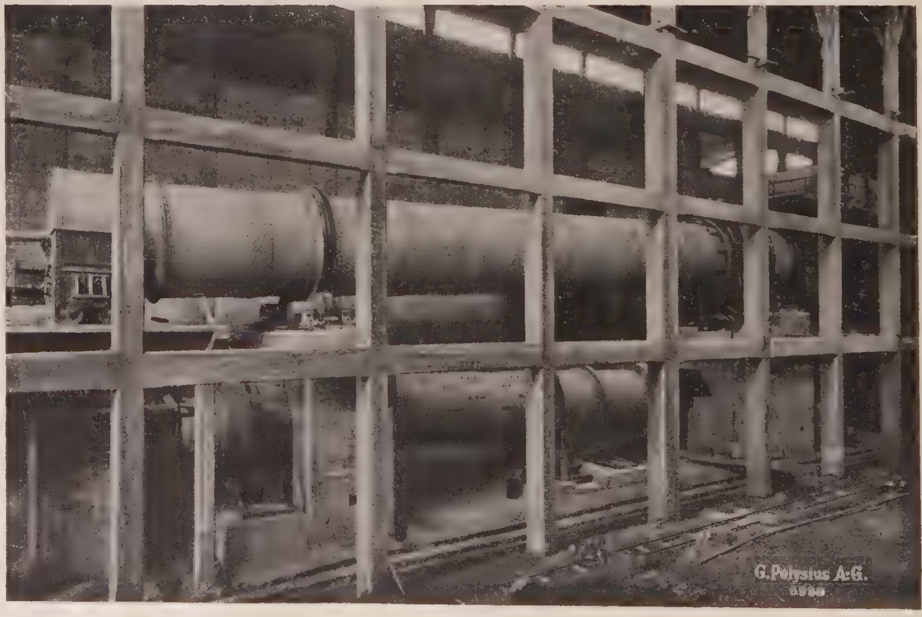


Fig. 8—Rotary clinker cooler

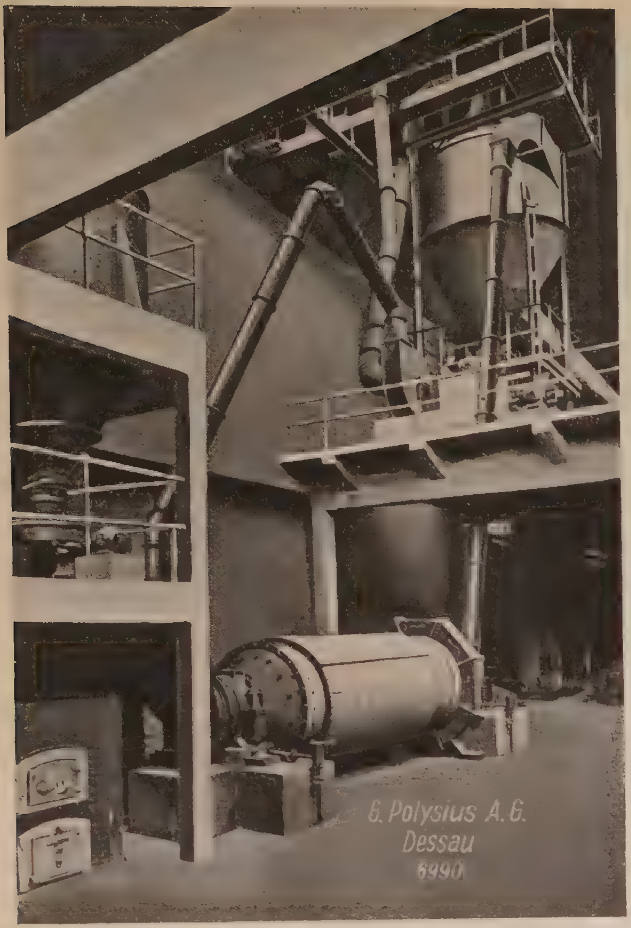


Fig. 9—Air-swept drying and grinding mill pulverizes coal

sure tanks which are alternately filled and discharged. The former shaft kilns at this Italian plant are used as storage silos, and are equipped with pneumatic aerating devices and discharge spouts (Fig. 5).

New Clinker-Burning Process

For burning clinker, a new burning process has been adopted which has as its outstanding features a very low fuel consumption and a high dependability of uninterrupted service. This process is known as the Lepol process,[1] and one of its main aims is to utilize all heat necessary for the proper burning of cement for the production of the cement itself. It therefore differs from processes which use only a part of the heat for the burning of the cement raw material, while the remaining part is used for special waste-heat utilization devices. An arrangement of waste-heat utilization devices used for purposes other than the manufacture of cement connects two departments manufacturing two different products, which very often interfere with one another.

The Lepol process uses all the heat within one machine unit for the one purpose—namely, producing cement. Not only from a production standpoint is this of highest importance, but also the fuel consumption is considerably lower, and the efficiency accordingly higher, compared with any other known process or system. The high efficiency is accomplished by the fact that the burning is divided into two stages, for which two connected machines are used. The drying and partial calcining of the raw material is done on a traveling grate (Fig. 6), and the complete calcination and clinkering is accomplished in a short rotary kiln. In order to be able to prepare the raw material properly on the traveling grate, it has to be put into the proper form. This is done by nodulizing the raw material up to marble-size balls in a nodulizing drum. The raw material coming from the feeding hopper in front of the kiln is discharged into the nodulizing drum, which rotates; and by adding a controlled amount of water in drops, the nodules are formed. Fig. 7 shows the scheme of the Lepol process kiln.

Flow of Materials

The flow of the material may be seen by referring to Fig. 7. The raw meal is fed to the granulating drum (5) by means of an adjustable feeder (4). Within the drum the raw meal is formed into nodules. The nodules pass into a hopper (6) and discharge from there onto the traveling grate (7), which conveys the nodules into the short rotary kiln (10). The gases flow in counter current to the raw material, and by means of a suction fan (13) are sucked through the layer of nodules on the traveling grate (7) and from there are discharged into the open through the exhaust stack (14). The gases, which when entering the traveling grate chamber have a temperature of from 1,600 to 1,700 deg. F., transfer practically all their heat while passing through the layer of nodules and are discharged at a temperature of about 200 deg. F. The nodules are dried and partially calcined by the hot gases. Through the proper preparation of the raw material within the traveling grate chamber, the rotary kiln can be kept unusually short, since only the completion of the calcining and the burning have to be done within the rotary kiln. The traveling grate of the plant here described is 7 ft. wide by 30 ft. 6 in. long. The kiln is a straight rotary kiln of 8 ft. 6 in. diameter, and 85 ft. long, running on two tires with roller supports. For cooling the clinker, a normal rotary

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[1] The Lepol kiln was described in detail in a series of articles by T. H. Arnold, in the *Cement Mill Edition* of CONCRETE, in the issues of April, May and June, 1932.

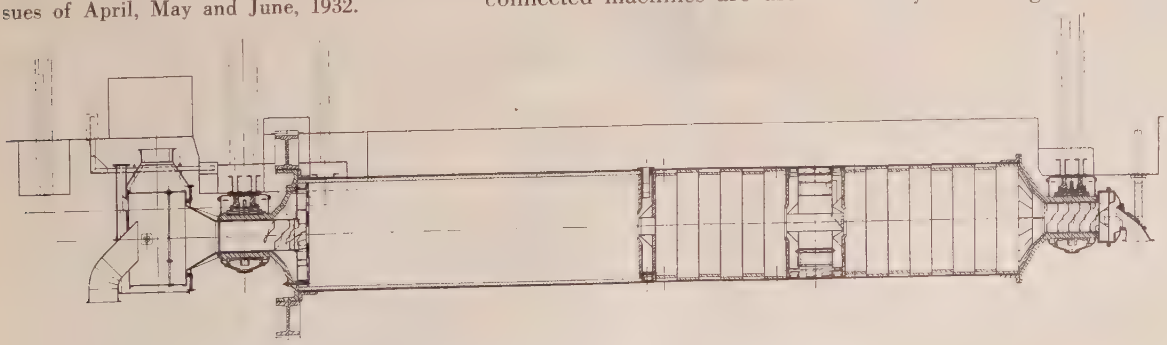

Fig. 10—Three-compartment Solo mill grinds clinker

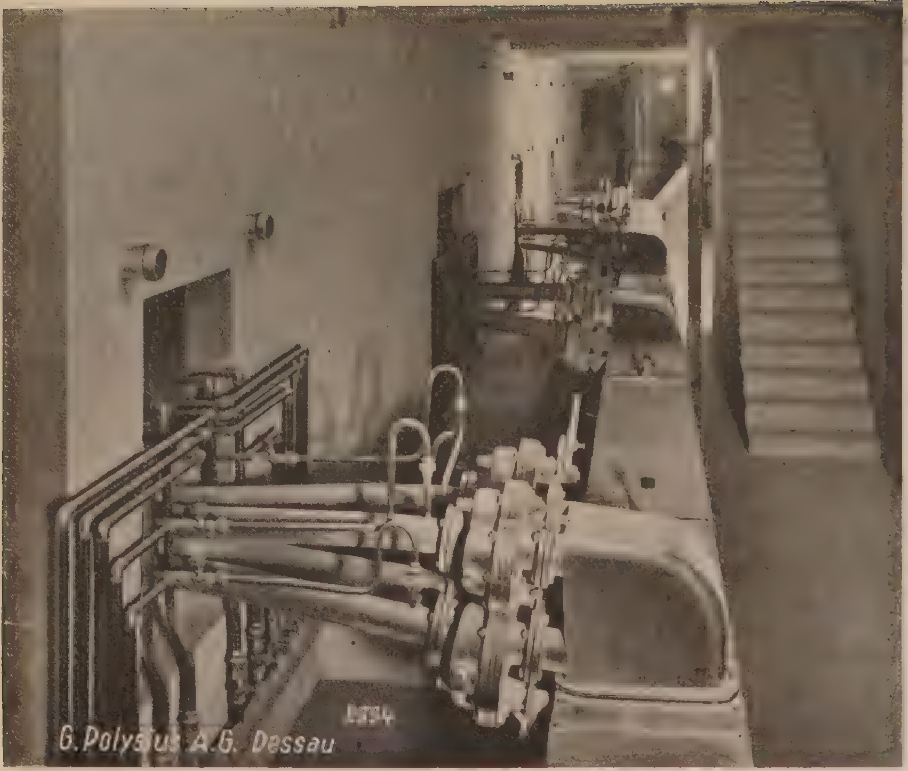

Fig. 11—Cement storage silos are provided with pneumatic aerating devices and pneumatic discharge spouts

clinker cooler 4 ft. 3 in. in diameter and 55 ft. long is installed. However, special inside cell devices are installed in order to obtain proper transfer of clinker heat for the secondary air of the combustion (see Fig. 8).

Extremely Low Fuel Consumption

Fuel consumption of a Lepol process kiln depends, within limits, upon the chemical and physical properties of the raw material. In general, it can be assumed that the fuel consumption in practically no case will exceed 680,000 B.t.u. per bbl. of clinker. The plant herein described has a fuel consumption of 641,000 B.t.u. per bbl. of clinker. Pulverized coal is used as fuel. The heat value of the coal used is 11,700 B.t.u. per lb., and therefore the coal consumption is 55 lb. per bbl. of clinker, or 14.3 per cent. Fuel consumption in many of the Lepol kilns which have been in operation for years is even considerably below this figure.

A Lepol kiln in Roumania, which uses oil as fuel, shows an average consumption of 585,000 B.t.u. per bbl. of clinker. A similar kiln in Japan uses 582,000 B.t.u. per bbl. of clinker, and a plant in Luxembourg uses 578,000 B.t.u. per bbl. In this Luxembourg plant limestone and blast-furnace slag are used as raw material. Figures given are average values covering long periods of operation. The Lepol process has been installed in more than 35 plants in Europe and practically all parts of the world—either in operation or under construction. In the United States a 1,000-bbl. plant has recently been put into operation, more detailed information of which will be given in the next issue of the *Cement Mill Edition* of CONCRETE.

Coal Preparation Plant with Air Swept Drying and Grinding Mill

The pulverized coal for the kiln is prepared by means of an air-swept drying and grinding mill similar to the one described for preparation of the raw material. Drying, grinding, and separating are done within the mill, and the collector of fines is used as a storage hopper in front of the kiln; and by an adjustable feeder the fines are discharged from this collector to the nozzle. The fineness of the pulverized coal is 85 per cent through the 200-mesh sieve (see Fig. 9). The clinker, when leaving the rotary cooler, is conveyed to the clinker storage located next to the kiln building, and an overhead traveling crane with a clam-shell grab bucket distributes it. This overhead traveling crane also takes care of feeding the clinker mill hoppers for charging clinker and gypsum and the coal mill hopper for feeding raw coal.

Clinker Grinding

For grinding the clinker a three-compartment *Solo* mill is installed. This type of mill combines high efficiency with low power consumption, and produces a cement of even quality. Construction of the mill is shown in Fig. 10. The mill runs on trunnion bearings. It has three compartments in which the different stages of grinding—coarse, medium, and fine—take place. The coarse grinding compartment is lined with cascade-shaped steel plates. A sealing device separates it from the second or medium grinding compartment. Tailings not properly prepared for the second compartment are automatically returned to the first compartment for regrinding. The second compartment is also lined with cascade-shaped steel plates, and is separated from the third or fine grinding compartment by a partition wall. The partition wall between the second and third compartments is adjustable and, according to the properties of the clinker, can be located at a point which produces the highest efficiency. The third or fine grinding compartment is lined with silex. The mill in the plant here described has a capacity of about 10 tons of clinker per hour, and the cement has a fineness of 91 per cent through the 200-mesh sieve. The cement is conveyed by a one-tank *Cera* pump to the cement silos. There are three cement silos similar to the raw material silos, and they are provided with pneumatic aerating devices and pneumatic discharge spouts (see Fig. 11). The cement is packed by Bates packers.

Dust Collecting

In the densely populated industrial districts of Europe one condition which can not be overlooked when erecting a cement plant is that the plant must have dustless operation. The dust not only is a prohibited nuisance, but it also represents a source of considerable loss which influences very unfavorably the production cost of the cement. With the design of the plant described herein, particular importance was attached to the elimination of all dust. The mills are equipped with large suction bag filters provided with automatic bag cleaning, which is accomplished by means of knocking devices and reverse air flow. The reverse air for the filters connected with the raw material grinding mill and the coal grinding mill is preheated in order to prevent clogging of the filter bags. A bag filter is also provided for

Robert Whitman Lesley
(1853-1935)

ROBERT WHITMAN LESLEY, eighty-two years old and one of the notable men of the American portland cement industry, died at his home in Haverford, Penna., on November 9.

Mr. Lesley, who was educated at the University of Pennsylvania, was closely identified with the cement industry from its very beginning in this country, and remained active in its affairs to the time of his passing.

Mr. Lesley was, likewise, closely associated with the magazine Concrete throughout the thirty-one years of its existence. It was in June, 1904, that he founded the monthly magazine Cement Age and served as editor and publisher until 1912, when it was consolidated with Concrete Engineering and published thereafter under the present name of Concrete. For many years following this consolidation, he served as consulting editor of Concrete, and his personal interest in the magazine was never relaxed.

It was so far back as 1874 that Mr. Lesley, then twenty-one years old, organized the firm of Lesley & Trinkle to deal in cement, first handling natural cement from Cumberland, Maryland. Spurred by a rise in freight rates, he started looking for less distant sources of cement, and in 1880 he became associated with David O. Saylor in the Lehigh Valley district in establishing several of the earliest portland cement manufacturing plants in America. He was in a position to develop the market for this new American-made product, and he was accorded much of the credit for winning acceptance of American portland cement in face of the prevailing preference for the imported product.

With an almost unlimited capacity for work, Mr. Lesley was active in all the principal associations and technical societies concerned with cement and concrete.

He was one of the charter members of the American Society for Testing Materials, of which he was vice-president for many years, and later became an honorary member.

He was the first president of the Portland Cement Association, organized in 1902 as the Association of American Portland Cement Manufacturers, and was the first honorary member of that organization.

In the early days of the American Concrete Institute he played an important part in its organization, and for many years he served the Institute as its treasurer.

He took similarly active part in the formation of the many important joint committees of various engineering societies dealing with cement and concrete, and the development of standard specifications.

ROBERT WHITMAN LESLEY

During the World War he was a member of the concrete ship committee of the American Concrete Institute; and in 1924, in collaboration with John B. Lober and George S. Bartlett, he wrote and published a *History of the Portland Cement Industry in the United States.*

At the time of his death Mr. Lesley was an honorary member, not only of the American Society for Testing Materials and the Portland Cement Association, but also of the American Concrete Institute, the American Chemical Society, the American Society of Civil Engineers, and the British Chemical Society.

Mr. Lesley is survived by his widow and two daughters.

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the packing plant. The pneumatically fed silos are provided with pressure-bag filters, which discharge the conveying air dust free into the open.

Lepol Kiln Operation Dust-Free

Under normal conditions the Lepol kiln requires no additional dust-collecting device, for the reason that its operation is practically dust-free. The dust collection takes place on the traveling grate, the layer of damp nodules through which the dust-laden gases have to pass catching the dust and conveying it to the rotary kiln. The cleaned and cooled gases are discharged through the exhaust stack.

Summary

As shown in the foregoing description, several new methods have been put into operation in this Italian plant, which allow considerable saving in the operating cost, improved quality of the cement, and a simplification of the operation. The air-swept drying and grinding mills dry, grind, and separate in one operation, and therefore separate drying drums and separators are not necessary. The pneumatic conveying pumps replace mechanical conveying apparatus, increase the dependability of

(*Continued on page* 48)

MILL EQUIPMENT

Large Output and High Reduction Claimed for Crusher

Cable Suspension Eliminates Vibration Mechanical Details of Crusher—Table of Operating Data

AMONG the outstanding units of cement mill equipment offered by the Allis-Chalmers Manufacturing Company, of Milwaukee, Wisconsin, is the Newhouse crusher, the gyratory type, designed to meet the requirements of large capacities and high reduction. The drive is direct, by an electric motor mounted above the crusher spider. A large, unobstructed receiving opening, it is claimed, permits easy feeding, while the short and rapid crushing action is said to result in increased capacity and greater uniformity of product. There are few working parts, all readily accessible.

Outstanding Features

The following are the principal features and advantages claimed for this crusher by the manufacturer:

1. Minimum number of working parts.
2. No gears and belts.
3. Minimum power requirements.
4. Large unobstructed feed opening.
5. Steep diaphragm, insuring free discharge.
6. Low oil consumption.
7. High ratio of reduction and uniform product.
8. Reversible non-choking concaves.
9. Self-contained with discharge spout, allowing crushed material to be fed direct to elevator or conveyor without additional hopper or chute.
10. Large capacity.
11. Low installation cost.
12. Accessibility of moving parts.

Method of Installation

Unlike all previous crushers, an expensive permanent foundation is not required. The Newhouse Crusher is suspended from the crushing plant structure by means of three cables. In addition to carrying the crusher these cables absorb the vibration and shock of crushing and prevent it from being transmitted to the suppporting structure. Where the crusher is to replace an obsolete or old machine, or where conditions favor the mounting on foundations, this method may be used with equal success by interposing springs under the base. Cable susppension is recommended.

Suspension Device

The suspension device consists of a clamp nut which fits the threaded upper portion of the main shaft.

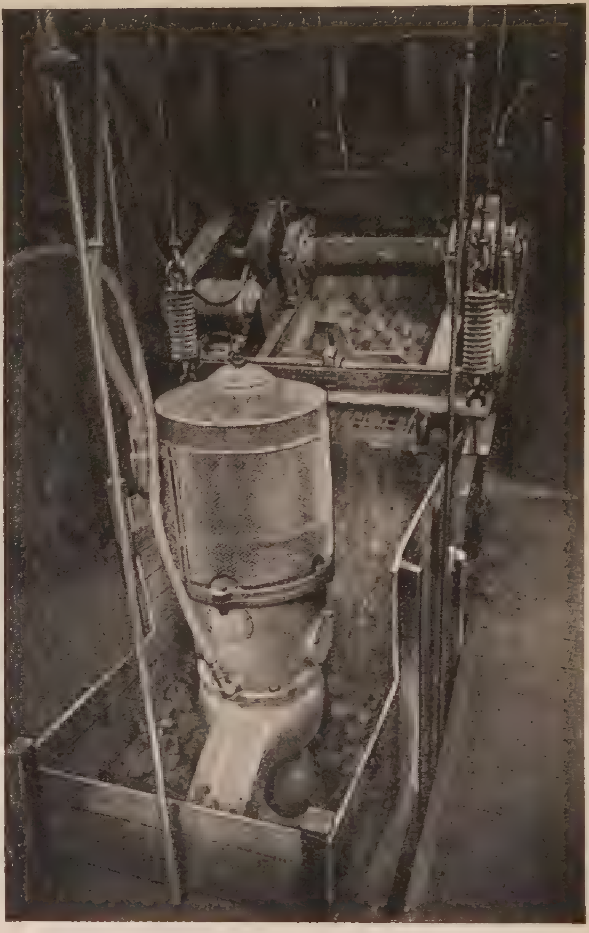


Fig. 1—The Newhouse crusher here illustrated is preceded by a 27-in. gyratory crusher followed by the intermediate 3-ft. by 8-ft. screen

OPERATING DATA—STYLE "B" NEWHOUSE CRUSHERS
(Sizes, Approximate Capacity, Motor Requirements and Weights)

Size Crusher and Width of Receiving Opening (Inches)	Capacities in Tons of 2,000 lbs. per Hour of Material Weighing 100 lbs. per Cu. Ft. Crushed															Motors		
	Discharge Opening on Close Side (Inches)																	
	¼	⅜	½	⅝	¾	⅞	1	1¼	1½	1¾	2	2¼	2½	2¾	3			
	Ring Size Product (Inches)																	
	⅜	½	¾	⅞	1	1¼	1⅜	1¾	2⅛	2½	2¾	3⅛	3½	3⅞	4¼	Horse-power	Full Load Speed of Motor and Gyrations per Minute	Approx. Net Wt. of Crusher Pounds
5	15	23	27	33	38	43	48	60	72	----	----	----	----	----	----	30 40	575 to 690	14,000
7	----	34	45	60	65	73	80	94	109	124	140	----	----	----	----	50 60 75	475 to 495	24,000
10	----	----	54	71	74	98	102	140	160	182	206	232	260	----	----	75 100 125	475 to 495	49,000
14	----	----	110	125	160	175	210	240	300	335	375	405	450	490	530	150 200 250	475 to 495	120,000

MILL EQUIPMENT

The weight of the shaft and the vertical thrust is carried by a spherical thrust bearing located under the suspension nut. The suspension nut provides an easy means for adjusting the crushing head to compensate for wear on the crushing surfaces and to alter the size of product. This is accomplished by inserting a spanner wrench through one of the ports in the motor support and adjusting the suspension nut.

Method of Operation

The eccentric is rotated by a vertical electric motor located on top of the spider. This connection is accomplished by an extension of the motor shaft, which passes through the hollow bored main shaft and is keyed to the eccentric through a drive plate which forms the bottom of the eccentric.

The eccentric rotates and the crusher head gyrates at the same speed as the motor.

The throw of the head or the amount of gyration depends upon the size of product for which the crusher is built, and is always made such as to produce the maximum capacity of the particular size required.

Oiling System

Lubrication is provided for the eccentric by means of a circulating oiling system consisting of a self-contained oil filtering and cooling tank with motor-driven centrifugal pump. The oil is filtered and cooled in the tank and pumped to the bottom plate, where it is forced upward to the top of the eccentric bearing and returns by gravity to the oil filter and cooler. An electrical flow indicator is located in the oil line. This is provided with a switch connected in the crusher motor circuit. If the oil flow is interrupted, the circuit is broken, a warning siren sounds and the crusher stops. The electrical control also prevents the crusher from being operated unless oil is circulating through the system.

The upper journal and suspension device are lubricated, independent of the circulating oiling system, through a pipe connection in the motor support. This is provided with a suitable gauge for determining the quantity of oil present.

Non-Choking Concaves

Non-choking concaves are regularly supplied, zinced in place in the top shell. They are of chilled iron or manganese steel, as required by the material to be crushed. The concaves are symmetrical with respect to a horizontal plane through their center and may be reversed when the lower ends are worn. After both ends are worn, further wear from the concaves may be obtained by setting them out in the usual manner, using the narrow key concave furnished with the crusher. The reversing operation can be repeated. Non-choking concaves have a curved crushing surface. They increase crusher capacity, permit close setting, save power, re-

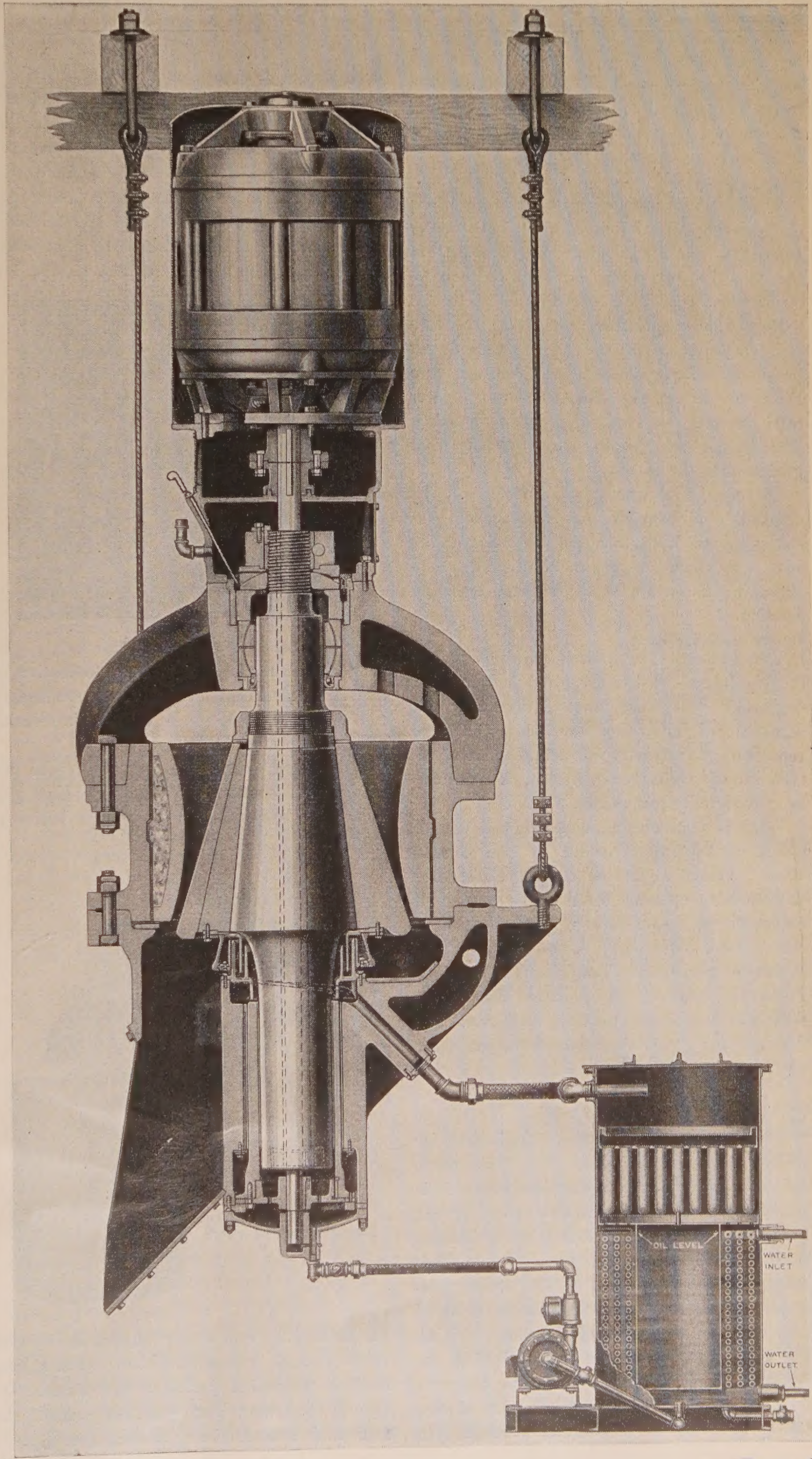


Fig. 2—Details of Newhouse crusher are shown in this sectional view

MILL EQUIPMENT

duce possibility of choking and stalling, and give longer life to crushing surfaces by more equal distribution of wear.

Eccentric Dust Seal

The seal between the main shaft and bottom shell below the crushing head is of a new and improved design. It has two distinct functions; first, it prevents leakage of oil; second, it positively prevents dust or water from entering eccentric bearing.

Size of Feed

Crusher sizes are designated by the width of receiving opening measured horizontally from the crushing head to the concaves at the top. For example, the 5-in. crusher receiving opening is 5 in. in width.

Reversible non-choking concaves are regularly supplied with the crushers, and for proper crushing action the feed should have a thickness or one-way dimension not greater than one-half the width of receiving opening. The length and width may be somewhat greater than the thickness.

For conditions where larger feed is to be crushed, non-reversible non-choking concaves are supplied. With this type of concave, the feed may have a maximum thickness approaching the width of the crusher receiving opening.

Capacity and Power

The capacity and power requirements of the Newhouse Crusher are given in the table. Capacities will vary greatly, depending on regularity of feed; therefore, while the table represents a summary of actual results obtained during regular operation, it can only be considered approximate.

There is a growing tendency on the part of operators to use dynamite in and around crushers when a piece of stone too large for the receiving opening is fed to the crusher or for removing tramp iron or steel wedged in the crusher chamber. Some operators use dynamite in removing heads from the shafts. These and other similar practices can not be construed as normal operating conditions, and the company's guarantee does not cover these irregularities.

◆

SELSYN is General Electric's trademark for self-synchronous apparatus. There are many instances in industrial operations where it is important to maintain a speed ratio between two rotating devices operating at a distance from each other; as in the case of kiln feeders where the excellence of the product depends largely on the maintenance of fixed ratio between the speed of the motor driving the kiln and that of the motor driving the feeder. Power Selsyns are said to assure a definite speed relation between the motors throughout the required speed range. In kiln-feeder installations, the makers claim Power Selsyns promote safety, improve the quality of the product, and lower replacement expense for kiln lining and shell.

◆

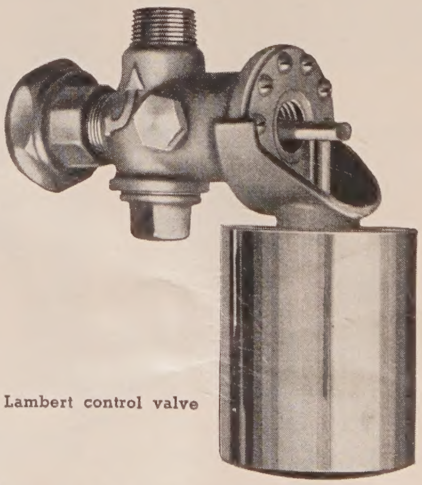
FUL-VUE is a new goggle, exactly like the well-known Ful-Vue spectacles in its appearance and in many of its design features, just announced by American Optical Company.

The F3100 Ful-Vue Goggle is fitted with the new 6-curve super armorplate lenses, capable of withstanding blows approximately twice as heavy as those which fracture standard lenses. The domed surface of the lens is declared to be exceptionally effective in deflecting glancing blows. Lenses are shaped to fit closely to the eye without interfering with eyebrows or lashes.

Ful-Vue goggles

It is stated that the dressy appearance and all-day-long comfort of F3100 Ful-Vue goggles make eye protection programs easier to enforce.

◆



Lambert control valve

LAMMERT control or automatic shut-off valves embody a number of new features and refinements which include: few parts; extremely compact; large capacity; simple design and construction; interchangeable elements for air control, steam-pressure control, water-pressure control or electrical control. Any one of these controls is connected by merely screwing it into the standard valve-body mechanism.

Valves can be adapted to automatic operation, to remote control, or to automatic operation plus an interlock with a manual-reset device, the makers say.

These valves, with the various types of interchangeable controls, are applicable to many uses on manufactured products or equipment as well as in the power or supply lines of present power plants.

Lammert liquid-control or automatic shut-off valves are made by Lammert & Mann Co., 220 N. Wood St., Chicago, Ill. They are made in standard sizes from ⅜ in. up.

Manufacturers' News

LINK-BELT Company, for many years located at 910 South Michigan Avenue, Chicago, has moved the executive offices to the Bell Building, 307 North Michigan Avenue, where they will occupy the entire twenty-third floor, and the north half of the twenty-first floor.

Industrial Literature

CONDOR WHIPCORD endless transmission belting is described in a new bulletin just issued by the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. There are specifications, horsepower tables, and sectional and installation views of the product as well as technical data on how to determine properly the length of endless belts.

◆

BRANDS of du Pont Explosives and Uses to Which They Are Adapted is the title of a bulletin containing an eighth edition of a chart issued for the purpose of aiding users of explosives to avoid the purchase of unsuitable explosives and to select those which will give the best results in proportion to cost.

◆

WOUND Rotor Induction Motors is the title of a new 4-page leaflet (No. 2100) by Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin.

◆

BULLETIN 33-C describes the Hardinge constant weight feeder made by the Hardinge Company, Inc., York, Pa.

Men and Mills

[News of and for Cement Mill Men]

A clearing-house page for all kinds of news about cement men and cement mills. ℂ Readers in all mills, even though not regular contributors, are invited to send in news notes about personal and plant activities that may be of interest or value to the men in other mills.

The executive committee of the National Safety Council for the coming year is made up of the following officers and members at large, nominated and approved at the Annual Safety Congress at Louisville in October:

General Chairman—D. B. Coleman, Missouri Portland Cement Co., St. Louis, Mo.

Vice-Chairman—Frederick B. Hunt, Nazareth Portland Cement Co., Nazareth, Pa.

Secretary—A. J. R. Curtis, Portland Cement Association, Chicago, Ill.

News Letter Editor—Jack Dempster, Canada Cement Co., Ltd., Port Colborne, Ontario, Canada.

Engineering Committee Chairman—William Moeller, Lone Star Cement Co., Dallas, Texas.

Membership Committee Chairman—Henry A. Reninger, Lehigh Portland Cement Co., Allentown, Pa.

Poster Committee Chairman—M. P. Greer, Marquette Cement Mfg. Co., Cape Girardeau, Mo.

Program Committee Chairman—W. J. Worthy, Medusa Portland Cement Co., Toledo, Ohio.

Members at Large—R. B. Fortuin, Pennsylvania-Dixie Cement Corp., Nazareth, Pa.; E. Posselt, International Cement Corp., New York, N. Y.; C. E. Ralston, Pittsburgh Plate Glass Co., Pittsburgh, Pa.; F. E. Town, Manitowoc Portland Cement Co., Manitowoc, Wis.; H. Vanderwerp, Medusa Portland Cement Co., Cleveland, Ohio; J. B. Zook, Great Lakes Portland Cement Co., Buffalo, N. Y.

On the shoulders of the above men lies the task of making the Cement Industry just a little safer.

◆

Alpha Portland Cement Company's preliminary report for the twelve months ending September 30, shows net loss of $269,181 against $259,776 in the preceding year.

◆

The *Calaveras Cement Co.* declared a dividend of $1 on the preferred dividends in arrears on October 31, payable November 15 to stock of record November 1. Payment of this dividend leaves $10.25 a share in arrears on the 7 per cent $100 par value preferred stock.

◆

The *Dewey Portland Cement Company's* plant reopened October 14, following a shutdown since September 1, with 290 employes returning to work. During the shutdown period the plant has undergone needed repairs.

Better business conditions and the prospect of receiving material contracts in the government's huge road building program were attributed by *Don Tyler*, general manager of the plant, as reasons for resuming operations.

◆

Ideal Cement Co. has called for payment as of January 1, 1936, all of the outstanding 5 per cent debentures, amounting to $1,386,300, at 102 and interest. Interest to January 1 will be paid on debentures presented for payment—the equivalent of $102.83 as of November 1.

◆

International Cement Corporation, in its sixtieth quarterly report, dated October 23, 1935, shows estimated net profit for the third quarter amounting to $299,707.74 as compared with $185,591.59 for the same period last year. The estimated net profit for the first nine months amounted to $754,727.76 as compared with $532,563.91 for the first nine months of 1934.

◆

International Cement Corporation called for redemption on November 1, 1935, $5,000,000 par value 20-yr. 5 per cent convertible gold debentures due May 1, 1948, at the call price of 103¼.

◆

Lehigh Portland Cement Co. reports for 12 months ended September 30, 1935, net profit of $265,712 after taxes, depreciation, depletion and obsolescence, equal to $2.14 a share on 124,072 shares (par $100) of 7 per cent preferred stock, excluding reacquired shares.

This compares with $495,853 or $3.14 a share on 157,817 preferred shares for the 12 months ended September 30, 1934.

◆

Two hundred and fifty cement workers were ordered back to work at the Lehigh Portland Cement plant at New Castle, Pa., on October 15. Wesley Davy is plant superintendent. The plant is operating on a four-shift basis, six hours to a shift, with each worker getting a 36-hour week. The plant has been down for some months.

◆

Pennsylvania-Dixe Cement Corp. and subsidiaries for 12 months ended September 30, 1935, reports a profit of $1,083,930 before depreciation, depletion and interest, comparing with profit of $978,425 for the 12 months ended September 30, 1934. After provision for depreciation, depletion and interest there was a net loss of $830,242 against net loss of $950,900 in preceding 12 months.

Current assets as of September 30, last, amounted to $4,179,833 and current liabilities were $245,557 against $4,821,348 and $333,195 respectively on September 30, 1934.

◆

A. F. Sayers of San Antonio, Texas, president of the Republic Portland Cement Company, has been named a member of the mineral resources committee of the Texas planning board.

◆

John Treanor, president of the Riverside Cement Co., Los Angeles, Cal., passed away recently following an accident.

◆

The state cement plant at Rapid City, S. D., is again in operation after a 30-day shutdown. The reserve supply is lower than for a long time which indicates that the plant will run until late in the winter. One hundred cars of cement were shipped during the first nine days of October, according to Manager *E. E. Hartley*.

◆

Superior Portland Cement Company paid a dividend of 55 cents a share on the class A stock November 1 to stock of record October 23, and ex-dividend on the San Francisco Curb Exchange October 18. This payment is for two deferred monthly dividends and leaves arrearage at $2.75 on the A stock.

◆

J. C. Van Doorn, Minneapolis, sales manager of the Universal Atlas Cement Company is retiring after more than 32 years' connection with the company. He has applied for pension under the rules of the company.

D. S. Day, former assistant sales manager, will succeeded Mr. Van Doorn as sales manager. Mr. Day has been with the Universal Atlas company for 28 years of which 23 years have been spent in Minneapolis.

◆

Erie L. Gale has been appointed assistant district sales manager for the Des Moines plant territory of the Pennsylvania-Dixie Cement Corporation, with headquarters in the Old Colony Building, Des Moines, Iowa.

Mr. Gale's experience in the cement industry extends over a period of 25 years and he has an extensive acquaintance in building supply and construction circles.

◆

Yosemite Portland Cement Company's plant, located just north of Merced, California, was damaged by fire recently to the extent of $60,000.

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NOTE:

The month in which an article appeared is followed by the page number.

Abbreviations found after references are defined as follows:

(E.) Editorial.

(H.) How to Do It.

(P.) Progress—In a Page.

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operation, reduce the cost of conveying, and simplify the layout of the plant. A pneumatic aerating and mixing device simplifies the blending of the raw material and contributes to the production of a first-class cement.

The Italian plant described herein was built between July and September, 1934, and started operations in January, 1935. The test runs proved that all the guarantees given by the concern that delivered the machinery were fulfilled. The plant has been operating without interruption ever since being put into operation. A very high grade of cement is produced, the tensile strength of which, after 28 days of combined storage, was 600 lb. per sq. in., with a compressive strength of 10,000 lb in. These strength tests show tha high grade cement is produced. quently the guarantees for the qualit the cement given by the concern delivered the machinery were met.

Acknowledgment. The plant was and all the machinery was delivere the firm of G. Polysius, A.-G., De Germany.